Panasonic

PROGRAMMABLE CONTROLLER

# FP7 High-speed Counter Unit

# User's Manual

WUME-FP7HSC-02

Phone: 800.894.0412 - Fax: 888.723.4773 - Web: www.ctiautomation.net - Email: info@ctiautomation.net

# Safety Precautions

Observe the following notices to ensure personal safety or to prevent accidents.
To ensure that you use this product correctly, read this User's Manual thoroughly before use.
Make sure that you fully understand the product and information on safety.
This manual uses two safety flags to indicate different levels of danger.

**WARNING**

**If critical situations that could lead to user's death or serious injury is assumed by mishandling of the product.**

-Always take precautions to ensure the overall safety of your system, so that the whole system remains safe in the event of failure of this product or other external factor.
-Do not use this product in areas with inflammable gas. It could lead to an explosion.
-Exposing this product to excessive heat or open flames could cause damage to the lithium battery or other electronic parts.

**CAUTION**

**If critical situations that could lead to user's injury or only property damage is assumed by mishandling of the product.**

-To prevent excessive exothermic heat or smoke generation, use this product at the values less than the maximum of the characteristics and performance that are assured in these specifications.
-Do not dismantle or remodel the product. It could cause excessive exothermic heat or smoke generation.
-Do not touch the terminal while turning on electricity. It could lead to an electric shock.
-Use the external devices to function the emergency stop and interlock circuit.
-Connect the wires or connectors securely.
The loose connection could cause excessive exothermic heat or smoke generation.
-Do not allow foreign matters such as liquid, flammable materials, metals to go into the inside of the product. It could cause excessive exothermic heat or smoke generation.
-Do not undertake construction (such as connection and disconnection) while the power supply is on. It could lead to an electric shock.

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# Introduction

Thank you for buying a Panasonic product. Before you use the product, please carefully read the installation instructions and the users manual, and understand their contents in detail to use the product properly.

# Types of Manual

- There are different types of users manual for the FP7 series, as listed below. Please refer to a relevant manual for the unit and purpose of your use.
- The manuals can be downloaded on our website.

| Unit name or purpose of use | Manual name | Manual code |
|---|---|---|
| FP7 Power Supply Unit | FP7 CPU Unit Users Manual (Hardware) | WUME-FP7CPUH |
| FP7 CPU Unit | FP7 CPU Unit Command Reference Manual | WUME-FP7CPUPGR |
| | FP7 CPU Unit Users Manual (Logging Trace Function) | WUME-FP7CPULOG |
| | FP7 CPU Unit Users Manual (Security Function) | WUME-FP7CPUSEC |
| Instructions for Built-in LAN Port | FP7 CPU Unit Users Manual (LAN Port Communication) | WUME-FP7LAN |
| Instructions for Built-in COM Port | FP7 series Users Manual (SCU communication) | WUME-FP7COM |
| FP7 Extension Cassette (Communication) (RS-232C/RS485 type) | | |
| FP7 Extension Cassette (Communication) (Ethernet type) | FP7 series Users Manual (Communication cassette Ethernet type) | WUME-FP7CCET |
| FP7 Extension (Function) Cassette Analog Cassette | FP7 Analog Cassette Users Manual | WUME-FP7FCA |
| FP7 Digital Input/Output Unit | FP7 Digital Input/Output Unit Users Manual | WUME-FP7DIO |
| FP7 Analog Input Unit | FP7 Analog Input Unit Users Manual | WUME-FP7AIH |
| FP7 Analog Output Unit | FP7 Analog Output Unit Users Manual | WUME-FP7AOH |
| FP7 High-speed counter Unit | FP7 High-speed counter Unit Users Manual | WUME-FP7HSC |
| FP7 Pulse Output Unit | FP7 Pulse Output Unit Users Manual | WUME-FP7PG |
| FP7 Positioning Unit | FP7 Positioning Unit Users Manual | WUME-FP7POSP |
| FP7 Serial Communication Unit | FP7 series Users Manual (SCU communication) | WUME-FP7COM |
| PHLS System | PHLS System Users Manual | WUME-PHLS |
| Programming Software FPWIN GR7 | FPWIN GR7 Introduction Guidance | WUME-FPWINGR7 |

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# 1

# Unit Functions and Restrictions

# 1.1 Unit Functions and How They Work

## 1.1.1 Functions of Unit

■ **Two or four-point 4 MHz/signed 32-bit high-speed counters are provided.**

- High-speed counting of input signals is available up to the maximum frequency 4 MHz (16MHz for 2-phase 4 multiple). It is selectable from 2-phase input (phase differential input), individual input or direction detection input in accordance with input devices such as an encoder and sensor.

■ **24 VDC, 12 VDC, 5 VDC inputs and line driver input are available.**

- The count input circuit supports both an open collector output and a line driver output (Differential output: Equivalent to AM26LS31).

■ **Selectable from ring counter or linear counter.**

- Both the ring counter and linear counter are available. The Z phase of an encoder can be used as count reset timing in the both methods.

■ **Frequency measurement function and Rotation speed measurement function are provided.**

- Frequencies are automatically measured in the unit from count values. Also, the rotation speed is automatically measured from count values and the pulse number for one rotation. The calculation results are directly stored in unit memories, thus no calculation using ladder programs is needed.

■ **The count of internal clocks is available.**

- Internal clocks occurred in the unit can be selected as count input signals. Timing measurement is ahievable with high accuracy of the maximum resolution 0.25 μs. The selectable internal clocks are 0.25 μs (4 MHz), 1 μs (1 MHz), 10 μs (100 kHz) and 100 μs (10 kHz).

■ **Capture function and Sampling capture function are provided.**

- It is possible to store the count value at the moment of the occurrence of a trigger assinged to a control signal. The count value independent of the scan time of PLC can be confirmed.
- The capture function is used to execute capturing at the leading and trailing edges of control signals, and the sampling capture function is used to execute capturing every sampling time (T [ms]) by signla input.
- Buffer function is added, which can save up to 60 captured data. (Available form High-speed counter unit Ver.1.2.)

■ **14 counter operations by input signals (input z signal, control signal and output relay (Y relay).**

1) Reset operation at rising edge, 2) Reset operation at trailing edge, 3) Positive logic reset operation,
4) Negative logic reset operation, 5) Preset operation at rising edge, 6)Preset operation at trailing edge,
7) Positive logic preset operation, 8) Negative logic preset operation, 9)Positive logic enable operation,
10) Negative logic enable operation, 11) Positive logic enable operation and reset operation at rising edge,
12) Negative logic enable operation and reset operation at trailing edge,
13) Positive logic enable operation and preset operation at rising edge,
14) Negative logic enable operation and preset operation at trailing edge

■ **Forced ON/OFF of external output relays (Y relays) is available.**

- External output relays can be forcibly turned on/off by the monitoring function of a programming tool or ladder program. It is usable for checking wirings when setting up the system.

■ **Band comparison function and Target value match comparison function are provided.**

- Two types of comparison functions are selectable for count values.
- In the band comparison function, a maximum of 16 band comparison conditions (max. 16 sets of upper and lower limits) can be specified for each counter. A maximum 16 outputs can be turned on/off for each comparison condition. It is also possible to turn on an external output relay when the count value is in the range of the specified condition.
- In the target value match comparison function, a maximum of 16 target value match comparison conditions can be specified for each counter. A maximum of 16 outputs are set or reset for each comparison condition in accordance with the count direction when the count value reaches a target value. It is also possible to turn on external output relays.

■ **Programmable output ON function**

- When using the band comparison function, the ON timing characteristics of external output relays can be changed.
  ON timing delay [1 ms ~ 1000 ms]: Delays the ON timing of output.
  ON hold time [1 ms ~ 1000 ms]: Holds the on state of output during a specified time.
  The ON timing delay and the ON hold time can be used in combination.

■ **Input time constant (Noise filter)**

- The noise filter function is available which sets the input time constant to reduce noises of input A, B and Z signals of each counter, and control signal lines.

| Input signal name | Noise filter type |
|---|---|
| Input A signal, input B signal (The same time constant for the both signals) | 0.1 µs (2 MHz), 0.2 µs (1 MHz), 0.5 µs (500 kHz), 1.0 µs (250 kHz), 2.0 µs (100 kHz), 10.0 µs (10 kHz) |
| Input Z signal | 0.1 µs (2 MHz), 0.2 µs (1 MHz), 0.5 µs (500 kHz), 1.0 µs (250 kHz), 2.0 µs (100 kHz), 10.0 µs (10 kHz) |
| Control signal | 2 µs, 5µs, 10 µs, 20 µs, 50 µs, 100 µs, 500 µs, 1 ms, 2 ms, 5 ms, 10 ms |

## 1.1.2 Unit Type and Product Number

| Name | | Product No. |
|---|---|---|
| FP7 High-speed counter unit | 2-ch type | AFP7HSC2T |
| | 4-ch type | AFP7HSC4T |

# 1.2 Restrictions on Combinations of Units

## 1.2.1 Restrictions on Power Consumption

The internal current consumption of the unit is as follows. Make sure that the total current consumption is within the capacity of the power supply with consideration of all other units used in combination with this unit.

| Name | | Product No. | Current consumption |
|---|---|---|---|
| FP7 High-speed counter unit | 2-ch type | AFP7HSC2T | 65 mA or less |
| | 4-ch type | AFP7HSC4T | 65 mA or less |

## 1.2.2 Applicable Versions of FPWIN GR7 and Units

For using the high-speed counter unit, the following versions of FPWIN GR7 and units are required.

| Item | Applicable version |
|---|---|
| Programmingn tool software FPWIN GR7 | Ver.1.2 or later |
| FP7 CPU unit | Ver.1.2 or later |
| FP7 Positioning unit | For using the interrupt function with the high-speed counter unit, Ver.1.1 or later is required. |

## 1.2.3 Restrictions on Interrupt Function

- The high-speed counter unit can activate interrupt programs of CPU using comparison match flags.
- However, the units which can use the function to activate interrupt programs should be in the range of the following specifications.

**■ Interrupt program specifications**

| Item | Specifications | |
|---|---|---|
| Interrupt program activation condition | Activates corresponding interrupt programs when the comparison match 0 flag and comparison match 1 flag of each channel turns on. | |
| No. of interrupt programs | Per 1 channel of High-speed counter unit | Max. 2 programs |
| | Per 1 High-speed counter unit | Max. 4 programs (2-ch type High-speed counter unit)<br>Max. 8 programs (4-ch type High-speed counter unit) |
| | Per 1 CPU unit | Max. 64 programs (8 programs x 8 units) |

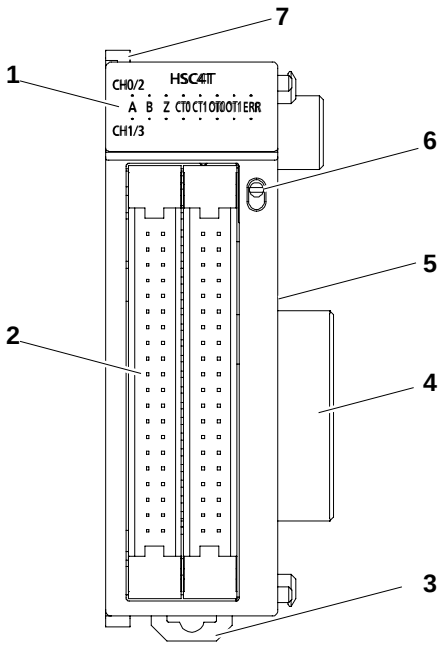
(Note 1) If interrupt occurs many times in one scan, the execution of intterupt program has priority, and the scan time will be longer.

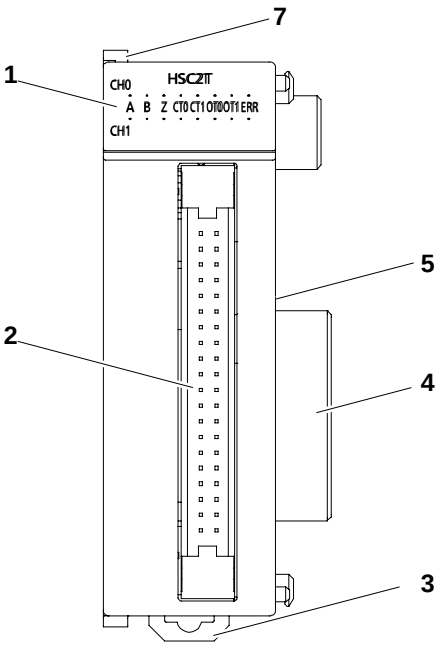
(Note 2) If more than one interrupt activation request is made from the unit, the process will be carried out from the smallest slot number or the smallest interrupt program number.

# 2

# Names and Functions of Parts

## 2.1 Names and Functions of Parts




### ① Operation monitor LEDs

Displays the on/off status of two channels. Use the display changeover switch to toggle between the channel number CH0/CH1 and CH2/CH3. The LEDs show the same information for each channel.

| LED | Description | Color | ON | OFF | Flashing |
|---|---|---|---|---|---|
| HSC | Power supply of the unit | Blue | ON | OFF | — |
| A | Pulse input A signal display | Green | Displays the status of the input signal | | |
| B | Pulse input B signal display | Green | Displays the status of the input signal | | |
| Z | Pulse input Z signal display | Green | Displays the status of the input signal | | |
| CT0 | Control 0 signal display | Green | Positive logic | Negative logic | — |
| CT1 | Control 1 signal display | Green | Positive logic | Negative logic | — |
| OT0 | External output 0 signal display | Green | ON | OFF | — |
| OT1 | External output 1 signal display | Green | ON | OFF | — |
| ERR | Error display | Red | If an error occurs | Normal operation | — |

(Note1): The LEDs for the pulse input signals flash according to the input statuses, thus look as if they are continuously lit if the input frequencies are high.

(Note 2): The LED of each input signal indicates the status after an input time constant processing.

### ② Input/output connector

Connector for input and output (40 pins) (Conforms to MIL standard)

**③DIN hook**

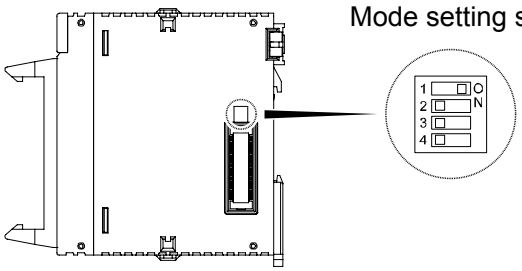
This hook is used to install the unit on a DIN rail.

**④ Unit connector**

Connects the internal circuits between units.

**⑤ Mode setting switch**

- Change the switch to use the interrupt function.
- At the factory setting, it is set to off (no interrupt function).




| | Description |
|---|---|
| 1 | ON: Interrupt function is enabled.<br>OFF: Interrupt function is disabled. |
| 2 | Not used |
| 3 | |
| 4 | |

**⑥ Display changeover switch**

Toggle between the display of 0ch/1ch and that of 2ch/3ch.

**⑦ Fixing hook**

This hook is used to fix units.

# 3

# Wiring and Input/Output Specifications

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# 3.1 Connection over Wire-pressed Terminal Cable

## 3.1.1 Specifications of Wire-pressed Terminal Cable

This is a connector that allows loose wires to be connected without removing the wires' insulation. The pressure connection tool is required to connect the loose wires.

Discrete-wire connector ( 40P )

**Suitable wires (strand wire)**

| Size | Nominal cross-sectional area | Insulation thickness | Rated current |
|---|---|---|---|
| AWG#22 | 0.3 $mm^2$ | 1.5 to 1.1 dia. | 3 A |
| AWG#24 | 0.2 $mm^2$ | | |

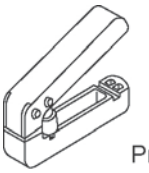
**Connector for wire-pressed terminal cable (provided with the unit)**

| Manufacturer | Composition of parts | Unit type and required quantity | |
|---|---|---|---|
| | | 2-ch type | 4-ch type |
| Panasonic made | Housing (40P) | 1 x 1 set | 1 x 2 sets |
| | Semi-cover (40P) | 2 x 1 set | 2 x 2 sets |
| | 5-pin contact (for AWG 22 and AWG24) | 8 x 1 set | 8 x 2 sets |

(Note) 1 connector set and 2 connector set are supplied with the 2-ch type unit and 4-ch type unit, respectively. If you need more connectors, purchase AFP2801 (2 sets/pack).

**Pressure connection tool**

| Manufacturer | Product no. |
|---|---|
| Panasonic made | AXY52000FP |



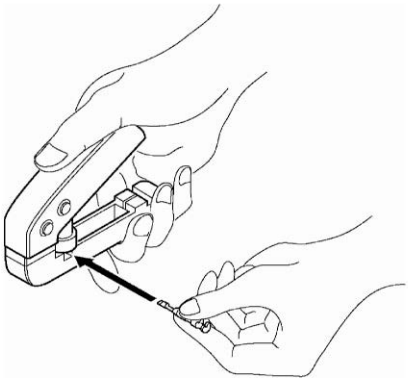
Pressure connection tool

### 3.1.2 Assembly of Connector for Wire-pressed Terminal Cable

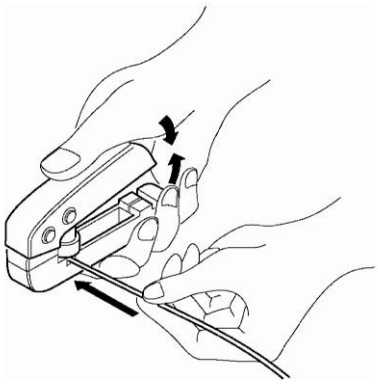
The wire end can be directly crimped without removing the wire's insulation, which saves wiring effort.

**(Procedure)**

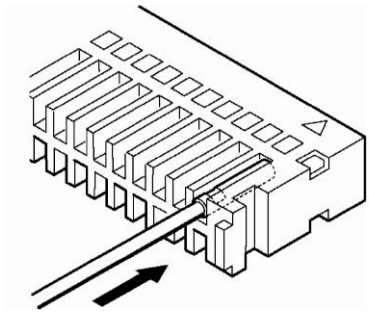
1. Bend the contact back from the carrier, and set it in the pressure connection tool.



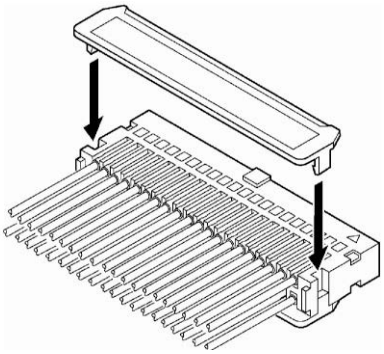
2. Insert the wire without removing its insulation until it stops, and lightly grip the tool.



3. After press fitting the wire, insert it into the housing.

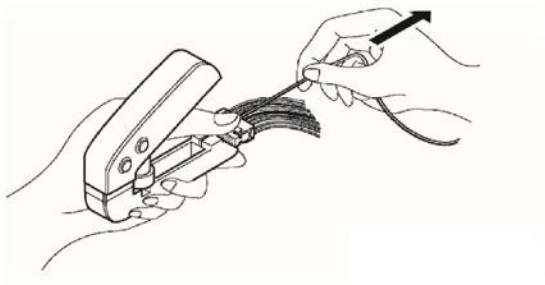


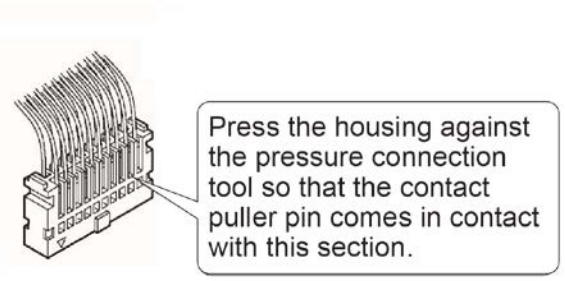
4. When all wires have been inserted, fit the semi-cover into place.



## ◆ KEY POINTS

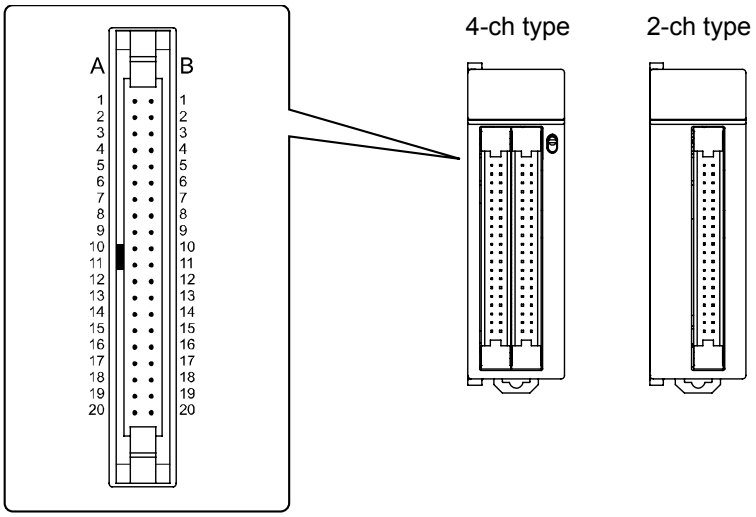
- **Contact puller pin to redo wiring**
  **If there is a wiring mistake or the wire is incorrectly pressure-connected, use the contact puller pin provided with the fitting to remove the contact.**




Press the housing against the pressure connection tool so that the contact puller pin comes in contact with this section.

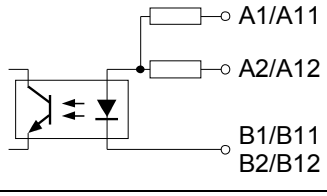
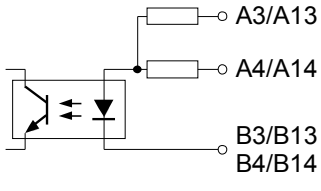
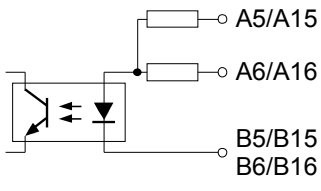
# 3.2 Terminal Circuit Diagram

## 3.2.1 I/O Terminal Layout Diagram

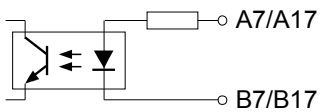
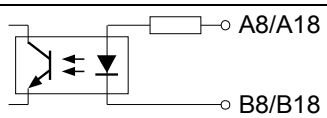



- Two connectors are used to connect the 4-ch type and one connector to connect the 2-ch type.
- The signal pins for two channels are assigned to one connector. There is no difference in pin arrangement between the CH0/CH1 connector and the CH2/CH3 connector if the unit is of the 4-ch type. Any pins with the same in number have the same function.

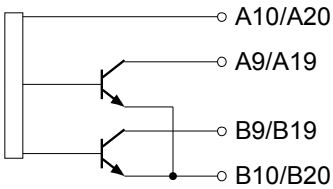
**Input terminal**

| Pin No. | | Circuit | Signal name |
|---|---|---|---|
| ch0/2 | ch1/3 | | |
| A1 | A11 |  | Input A: 24 VDC (12 to 24 VDC) |
| A2 | A12 | | Input A: 5 VDC (3.5 to 5 VDC) |
| B1 | B11 | | Input A: COM |
| B2 | B12 | | Input A: COM |
| A3 | A13 |  | Input B: 24 VDC (12 to 24 VDC) |
| A4 | A14 | | Input B: 5 VDC (3.5 to 5 VDC) |
| B3 | B13 | | Input B: COM |
| B4 | B14 | | Input B: COM |
| A5 | A15 |  | Input Z: 24 VDC (12 to 24 VDC) |
| A6 | A16 | | Input Z: 24 VDC (3.5 to 5 VDC) |
| B5 | B15 | | Input Z: COM |
| B6 | B16 | | Input Z: COM |

**Control 0/1 (common)**

| Pin No. | | Circuit | Signal name |
|---|---|---|---|
| ch0/2 | ch1/3 | | |
| A7 | A17 |  | Control 0: (12 to 24 VDC) |
| B7 | B17 | | Control 0: COM |
| A8 | A18 |  | Control 1: (12 to 24 VDC) |
| B8 | B18 | | Control 1: COM |

**External output 0/1 and Power supply terminal (common)**

| Pin No. | | Circuit | Signal name |
|---|---|---|---|
| ch0/2 | ch1/3 | | |
| A9 | A19 |  | External output 0: Sink output (5 to 24 VDC, 15 mA) |
| B9 | B19 | | External output 1: Sink output (5 to 24 VDC, 15 mA) |
| A10 | A20 | | Power supply for output: 24 VDC |
| B10 | B20 | | Power supply for output: GND |

(Note 1): For using external output (A9, A19, B9, B19), power should be supplied to the power supply for output (A10, A20, B10, B20). When the external output is not used, there is no need to supply the power to the power supply for output.

# 3.3 Input/Output Specifications

## 3.3.1 Input Specifications

| Item | Description | | | |
|---|---|---|---|---|
| | Input A, B, Z signals | | | Control signal |
| | 24VDC | 5VDC | | |
| | | Open collector connection | Line driver connection | |
| Insulation method | Optical coupler | | | Optical coupler |
| Rated input voltage | 12 V DC to 24 V DC | 5VDC | Equivalent to AM26LS31 | 12VDC to 24VDC |
| Operating voltage range | 10.8 V DC to 26.4 V DC | 3.5VDC to 5.5VDC | | 10.8VDC to 26.4VDC |
| Input points per common | Independent common for each point | | | Independent common for each point |
| Min. on voltage/Min. on current | 10V DC / 4 mA | 3 V DC / 4 mA | | 10 V DC / 4 mA |
| Max. off voltage/Max. off current | 2V DC / 2mA | 1 V DC / 0.5 mA | | 2V DC / 2 mA |
| Input impedance | Approx. kΩ | Approx. 390 Ω | | Approx. 3 kΩ |
| Operating mode indicator | LED display | | | LED display |

(Note) The duty ratio of count input should be 50±10%. Also, the phase shifting of 2-phase input should be less than 5%.

## 3.3.2 Output Specifications

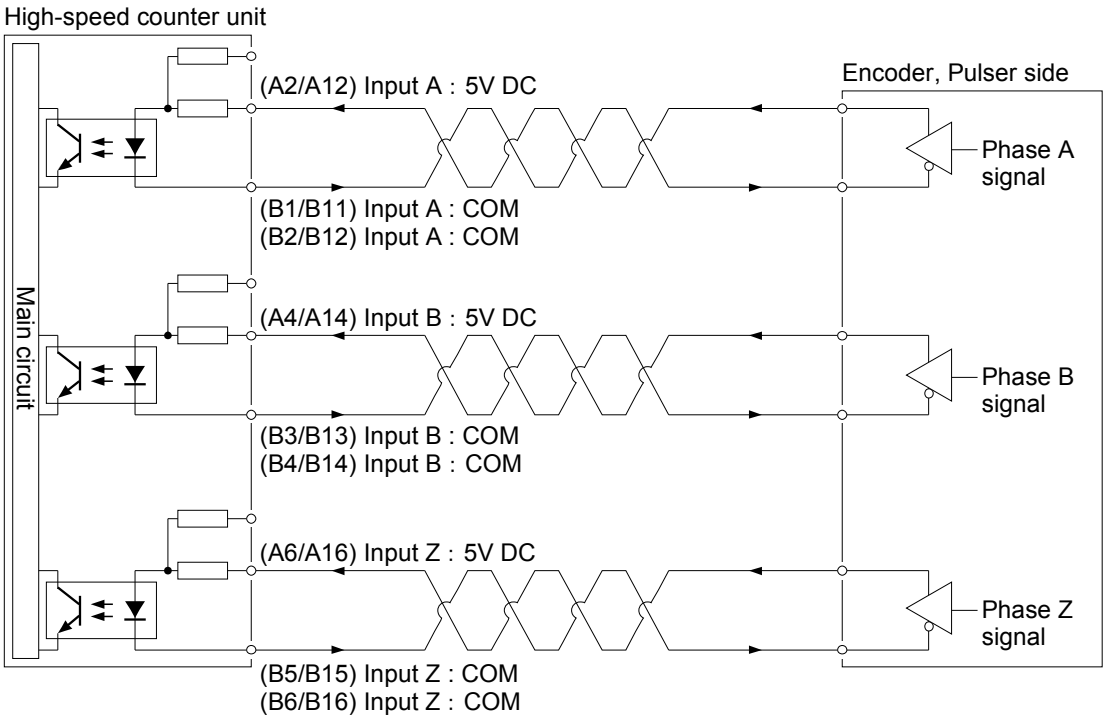
| Item | | Description |
|---|---|---|
| Insulation method | | Optical coupler |
| Output type | | Open collector (Sink output) |
| Rated load voltage | | 5 V DC to 24 V DC |
| Allowable load voltage range | | 4.75 V DC to 26.4 V DC |
| Max. load current | | 15 mA |
| Output points per common | | 2 points/common |
| Off state leakage current | | 1 μA or less |
| ON Max. voltage drop | | 0.2 VDC or less |
| External power supply | Voltage | 21.6VDC to 26.4VDC |
| | Current | 30 mA or less |
| Surge absorber | | Zener diode |
| Operating mode indicator | | LED display |

# 3.4 Precautions on Wiring and Connection of Count Input

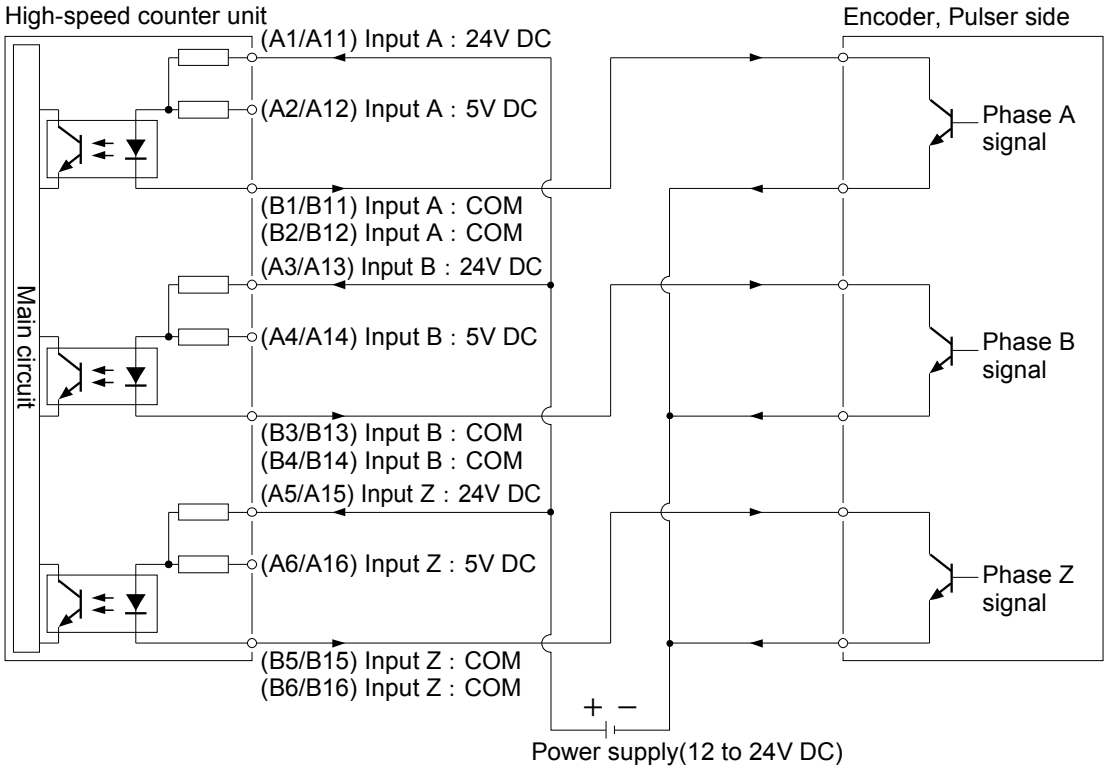
## 3.4.1 Precautions on Wiring

- For the connection between the count input (phases A, B, Z) and encoder, etc., use shielded twisted-pair cables.
- The length of connected wires should be within 10 m.

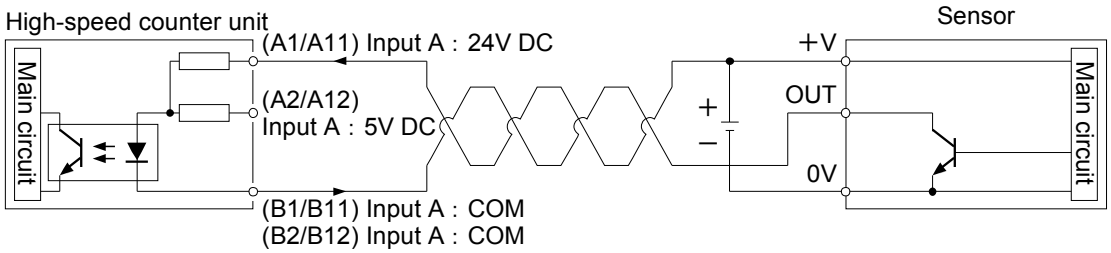
## 3.4.2 For Line Driver of Encoder Input


High-speed counter unit
Main circuit
(A2/A12) Input A : 5V DC
(B1/B11) Input A : COM
(B2/B12) Input A : COM
(A4/A14) Input B : 5V DC
(B3/B13) Input B : COM
(B4/B14) Input B : COM
(A6/A16) Input Z : 5V DC
(B5/B15) Input Z : COM
(B6/B16) Input Z : COM
Encoder, Pulser side
Phase A signal
Phase B signal
Phase Z signal

### 3.4.3 For Transistor Open Collector Type of Encoder Input


High-speed counter unit
Encoder, Pulser side
(A1/A11) Input A : 24V DC
(A2/A12) Input A : 5V DC
Phase A signal
(B1/B11) Input A : COM
(B2/B12) Input A : COM
(A3/A13) Input B : 24V DC
Main circuit
(A4/A14) Input B : 5V DC
Phase B signal
(B3/B13) Input B : COM
(B4/B14) Input B : COM
(A5/A15) Input Z : 24V DC
(A6/A16) Input Z : 5V DC
Phase Z signal
(B5/B15) Input Z : COM
(B6/B16) Input Z : COM
+ −
Power supply(12 to 24V DC)

### 3.4.4 For Sensor Input



# 4

# Unit Allocation and Parameter Settings

Phone: 800.894.0412 - Fax: 888.723.4773 - Web: www.ctiautomation.net - Email: info@ctiautomation.net

# 4.1 Unit Allocation

## 4.1.1 Confirmation of I/O Allocation Information

Input and output relays are allocated.

■ **Input relays**

| I/O number | | | | | | | | Name | Description |
|---|---|---|---|---|---|---|---|---|---|
| CH0 | | CH1 | | CH2 | | CH3 | | | |
| WX0 | X0 | WX2 | X20 | WX4 | X40 | WX6 | X60 | Operation ready done | Flag to indicate the counter operation is ready. |
| | X1 | | X21 | | X41 | | X61 | Counter enable | Flag to indicate the counter operation is enabled. |
| | X2 | | X22 | | X42 | | X62 | Count direction | Flag to indicate a count direction.<br>ON: Forward (Addition) OFF: Reverse (Subtraction) |
| | X3 | | X23 | | X43 | | X63 | — | — |
| | X4 | | X24 | | X44 | | X64 | Capture 0 done flag | Flag to announce that the count value is stored in capture 0 register. |
| | X5 | | X25 | | X45 | | X65 | Capture 1 done flag | Flag to announce that the count value is stored in capture 1 register. |
| | X6 | | X26 | | X46 | | X66 | External output 0 signal monitor | Monitors the output state of external output 0 signal. |
| | X7 | | X27 | | X47 | | X67 | External output 1 signal monitor | Monitors the output state of external output 1 signal. |
| | X8 | | X28 | | X48 | | X68 | Input A signal monitor | Monitors the input state of input A signal. |
| | X9 | | X29 | | X49 | | X69 | Input B signal monitor | Monitors the input state of input B signal. |
| | XA | | X2A | | X4A | | X6A | Input Z signal monitor | Monitors the input state of input Z signal. |
| | XB | | X2B | | X4B | | X6B | Control 0 signal monitor | Monitors the output state of control 0 signal. |
| | XC | | X2C | | X4C | | X6C | Control 1 signal monitor | Monitors the output state of control 1 signal. |
| | XD | | X2D | | X4D | | X6D | Overflow annunciation | Flag to announce the occurrence of overflow or underflow (Enabled for the linear counter only.) |
| | XE | | X2E | | X4E | | X6E | Underflow annunciation | |
| | XF | | X2F | | X4F | | X6F | Error annunciation | Flag to announce the occurrence of an error. |
| WX1 | X10 ~ X19 | WX3 | X30 ~ X39 | WX5 | X50 ~ X59 | WX7 | X70 ~ X79 | Comparison match 0 flag ~ Comparison match 9 flag | Flag to reflect the results of the band comparison function or target value match function. |
| | X1A ~ X1F | | X3A ~ X3F | | X5A ~ X5F | | X7A ~ X7F | Comparison match A flag ~ Comparison match F flag | |

(Note 1): The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit.
Example) When the starting word number for the unit is "10", the operation ready done flag for CH0 is X100.

■ **Output relays**

| I/O number | | | | | | | | Name | Enabled condition | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| CH0 | | CH1 | | CH2 | | CH3 | | | | |
| WY0 | Y0 | WY1 | Y10 | WY2 | Y20 | WY3 | Y30 | Operation ready request | Level | Relay to recalculate the setting parameter of counter. |
| | Y1 | | Y11 | | Y21 | | Y31 | Count enable request | Level | Relay to start the counter operation. |
| | Y2 | | Y12 | | Y22 | | Y32 | Reset request | ON edge | Relay to reset count values. |
| | Y3 | | Y13 | | Y23 | | Y33 | Preset request | ON edge | Relay to preset count values. |
| | Y4 | | Y14 | | Y24 | | Y34 | Reset enable request | Level | Relay to enable the reset by the control signal and input Z signal. |
| | Y5 | | Y15 | | Y25 | | Y35 | Current value change request | ON edge | Relay to request for changing the current value of counter. |
| | Y6 | | Y16 | | Y26 | | Y36 | Preset value change request | ON edge | Relay to request for changing preset values. |
| | Y7 | | Y17 | | Y27 | | Y37 | Capture enable request (Note 2) | Level | Capture enable request when using the capture function or capture trigger signal when using the sampling capture function. |
| | Y8 | | Y18 | | Y28 | | Y38 | — | — | — |
| | Y9 | | Y19 | | Y29 | | Y39 | External output 0 forced ON | Level | Relay to forcibly turn on the external output 0. |
| | YA | | Y1A | | Y2A | | Y3A | External output 0 forced OFF | Level | Relay to forcibly turn off the external output 0. |
| | YB | | Y1B | | Y2B | | Y3B | External output 1 forced ON | Level | Relay to forcibly turn on the external output 1. |
| | YC | | Y1C | | Y2C | | Y3C | External output 1 forced OFF | Level | Relay to forcibly turn off the external output 1. |
| | YD | | Y1D | | Y2D | | Y3D | Overflow clear | ON edge | Relay to clear the overflow annunciation flag. |
| | YE | | Y1E | | Y2E | | Y3E | Underflow clear | ON edge | Relay to clear the underflow annunciation flag. |
| | YF | | Y1F | | Y2F | | Y3F | Error clear | ON edge | Relay to clear errors. |

(Note 1): The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit.
Example) When the starting word number for the unit is "10", the operation ready request flag for CH0 is Y100.
(Note 2) How the capture enable request signal works varies according to the functions to be used.

## 4.1.2 Number of Occupied Points of High-speed Counter Unit

- The following I/O numbers are used for the high-speed counter unit.
- As the input and output starts from the same I/O numbers in FP7 series, the following number of words is occupied.

| Name | Product No. | No. of I/O points actually used | | No. of occupied words (No. of occupied points) |
|---|---|---|---|---|
| | | Input | Output | |
| 2-ch type | AFP7HSC2T | 8 words (128 points) | 4 words (64 points) | 8 words (128 points) |
| 4-ch type | AFP7HSC4T | | | |

Example) The both 2-ch type and 4-ch type high-speed counter units occupy 8 words (128 points).

| | Slot No. | Unit to use | Staring word... |
|---|---|---|---|
| ☐ | 0 | CPS4E CPU unit | 0 |
| ☐ | 1 | High-speed counter unit (4 ch) | 10 |
| ☑ | 2 | Input unit (DC type), 64 points | 18 |

### 4.1.3 Registration in I/O Map

Before setting parameters, register the unit to be used in the I/O map.

**PROCEDURE**

1. **Select "Options" > "FP7 Configuration" in the menu bar.**

   The FP7 Configuration dialog box is displayed.

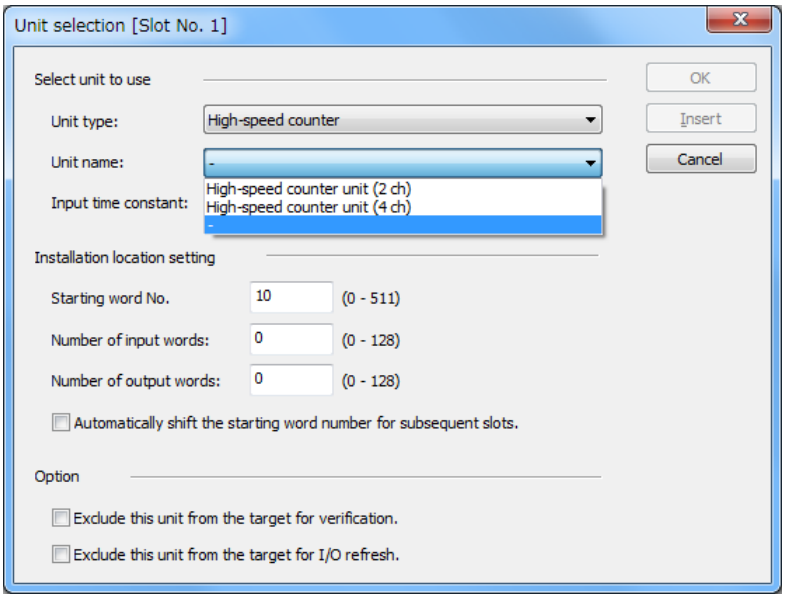
2. **Select "I/O map" in the left pane.**

   The allocation menu of the I/O map is displayed.

3. **Double-click a desired slot.**

   The Unit selection dialog box is displayed.

4. **Select "High-speed counter" for "Unit type" and select the unit name used, and press the "OK" button.**




The selected unit is now registered in the I/O map.

# 4.2 Configuration of High-speed Counter Unit

## 4.2.1 Configuration Using Tool Software

The counter type, operation mode and the settings of the high-speed counter are specified in the configuration menu of FPWIN GR7.

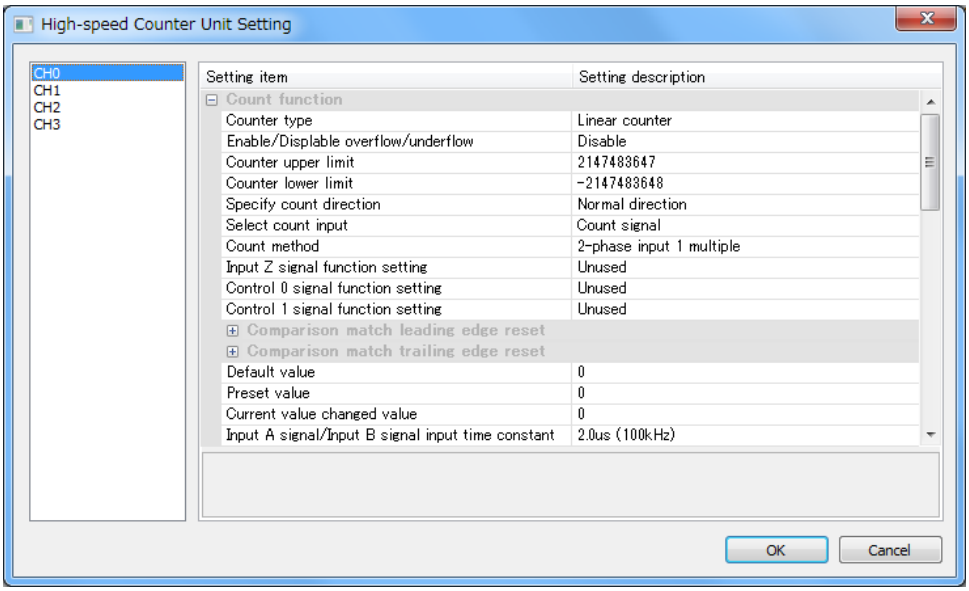
■ **Setting method**

The following procedure describes the process when the high-speed counter unit has been already allocated in the I/O map.

◆ **PROCEDURE**

1. **Select "Options" > "FP7 Configuration" in the menu bar.**
2. **Select "I/O map" in the field.**
3. **Select the slot where the high-speed counter unit has been registered, and select the "Advanced" button.**

   The High-speed Counter Unit Setting dialog box is displayed.




4. **Select items according to the conditions used.**
5. **Press the [OK] button.**
6. **The set values are downloaded with programs as a project, and will be effective when the operation ready request is executed.**

## 4.2.2 Configuration Data Setting Items

■ **Count function (Settable for each channel)**

| item | Description | Default |
|---|---|---|
| Counter type | Linear counter/Ring counter | Linear counter |
| Enable/Disable overflow/underflow | Disable/Enable | Disable |
| Counter upper limit | -2,147,483,647 to 2,147,483,647 | 2,147,483,647 |
| Counter lower limit | -2,147,483,648 to 2,147,483,646 | -2,147,483,648 |
| Count direction | Normal direction/Reverse direction | Normal direction |
| Count input selection | Count signal<br>Internal clock 0.25 us (4 MHz)<br>Internal clock 1.00 us (1 MHz)<br>Internal clock 10 us (100 kHz)<br>Internal clock 100 us (10 kHz) | Count signal |
| Count method | 2-phase input 1 multiple, 2-phase input 2 multiple,<br>2-phase input 4 multiple, Individual input 1 multiple, Individual input 2 multiple,<br>Direction detection input 1 multiple,<br>Direction detection input 2 multiple | 2-phase input 1 multiple |
| Input Z signal function setting | Not used<br>Reset operation at rising edge<br>Reset operation at trailing edge<br>Positive logic reset operation<br>Negative logic reset operation<br>Preset operation at rising edge<br>Preset operation at trailing edge<br>Positive logic preset operation<br>Negative logic preset operation | Not used |
| Control 0 signal function setting | Not used<br>Positive logic enable operation<br>Negative logic enable operation<br>Positive logic enable operation and reset operation at rising edge<br>Negative logic enable operation and reset operation at trailing edge<br>Positive logic enable operation and preset operation at rising edge<br>Negative logic enable operation and preset operation at trailing edge | Not used |
| Control 1 signal function setting | Not used<br>Positive logic enable operation<br>Negative logic enable operation | Not used |
| Comparison match leading edge reset | Specify the comparison match flag used as a reset signal for resetting count values at the rising edge of comparison match flag. | Not reset |
| Comparison match trailing edge reset | Specify the comparison match flag used as a reset signal for resetting count values at the trailing edge of comparison match flag. | Not reset |
| Default value | Set the count value when the power is turned on.<br>-2,147,483,648 to 2,147,483,647 | 0 |
| Preset value | Set the count value for the preset operation.<br>-2,147,483,648 to 2,147,483,647 | 0 |
| Current value changed value | Set the current value changed value to change the count value.<br>-2,147,483,648 to 2,147,483,647 | 0 |

☛ next page

| | | |
|---|---|---|
| Input A signal/Input B signal input time constant<br>Input Z signal input time constant | No input time constant, 0.1 us ( 2 MHz), 0.2 us (1 MHz), 0.5 us (500 kHz), 1.0 us (250 kHz), 2.0 us (100 kHz), 10.0 us (10 kHz) | 2.0 us (100 kHz) |
| Control signal input time constant | No input time constant /2 us / 5 us / 10 us / 20 us / 50 us / 100 us / 500 us / 1.0 ms / 2.0 ms / 5.0 ms / 10.0 ms | 2.0 ms |

(Note 1): The control 0 signal and control 1 signal cannot be assinged to the capture function if they are assigned to the enable operation.

## ■ Measurement function (Settable for each channel)

| item | Description | Default |
|---|---|---|
| Measurement function selection | Not use measurement function<br>Frequency measurement<br>Frequency measurement and rotation speed measurement A<br>Frequency measurement and rotation speed measurement B | Not use measurement function |
| Pulse number per rotation | Set the pulse number for one rotation of the encoder.<br>Setting range: 1 to 1,048,575 | 1 |
| Average number of frequency measurement processes | No averaging, 2, 4, 8, 16, 32, 64, 128 times | No averaging |
| Average number of rotation speed measurement processes | No averaging, 2, 4, 8, 16, 32, 64, 128 times | No averaging |

## ■ Comparison function (Settable for each channel)

<table>
<tr><th>item</th><th colspan="3">Description</th><th>Default</th></tr>
<tr><td>Comparison function selection</td><td colspan="3">Not use<br>Band comparison<br>Target value match comparison</td><td>Not use</td></tr>
<tr><td>Comparison input selection</td><td colspan="3">Count value<br>Measurement value (Frequency)<br>Measurement value (Rotation speed)</td><td>Count value</td></tr>
<tr><td>Nmber of comparison data</td><td colspan="3">Set the judgement value for the comparison function.<br>Setting range: 1 to 16</td><td>16</td></tr>
<tr><td rowspan="2">Comparison data 0 ~ Comparison data 15<br>(For band comparison)</td><td colspan="3">Specify the lower and upper limits for each comparison data. (Note 1)<br>Setting range: -2,147,483,648 to 2,147,483,647</td><td>0</td></tr>
<tr><td colspan="3">Select the set patterns, on or off, for the comparison match 0 flag to the comparison match F flag for each comparison data.</td><td>OFF</td></tr>
<tr><td rowspan="5">Comparison data 0 ~ Comparison data 15<br>(For target value match)</td><td colspan="3">Specify target values for each comparison data.<br>Setting range: -2,147,483,648 to 2,147,483,647</td><td>0</td></tr>
<tr><td colspan="3">Select the pattern, set or reset, according to the situation when reaching the target value (addition or subtraction) for each comparison data.</td><td rowspan="4">No change</td></tr>
<tr><td></td><td>Addition set pattern:</td><td>Set output, no change</td></tr>
<tr><td></td><td>Addition reset pattern:</td><td>Reset output, no change</td></tr>
<tr><td></td><td>Subtraction set pattern:</td><td>Set output, no change</td></tr>
<tr><td></td><td>Subtraction reset pattern:</td><td>Reset output, no change</td></tr>
</table>

(Note 1): Lower and upper limits can be set in the range of the lower and upper limits of the counters.
For the linear counter, the set lower limit should be less than the upper limit. For the ring counter, they can be set in any range.

## ■ External output function (Settable for each channel)

| item | | Description | Default |
|---|---|---|---|
| External output 0 | Signal setting | Not output/Output | Not output |
| | Output hold setting | Set the condition of the output when a CPU or high-speed counter error occurs.<br>Not hold/Hold | Not hold |
| | ON timing delay | Setting range: 0 to 1,000 ms | 0 ms |
| | ON hold time | Setting range: 0 to 1,000 ms | 0 ms |
| External output 1 | Signal setting | Not output/Output | Not output |
| | Output hold setting | Set the condition of the output when a CPU or high-speed counter error occurs.<br>Not hold/Hold | Not hold |
| | ON timing delay | Setting range: 0 to 1,000 ms | 0 ms |
| | ON hold time | Setting range: 0 to 1,000 ms | 0 ms |

(Note 1): The ON timing delay and ON hold time are enabled only when the band comparison function is used.

## ■ Capture function (Settable for each channel)

| item | Description | Default |
|---|---|---|
| Capture 0 setting | Not use capture 0 function<br>Capture function at rising edge of control 0 signal<br>Capture function at trailing edge of control 0 signal<br>Capture function at rising edge of control 1 signal<br>Capture function at trailing edge of control 1 signal<br>Control 0 signal positive logic sampling capture function<br>Control 0 signal negative logic sampling capture function<br>Control 1 signal positive logic sampling capture function<br>Control 1 signal negative logic sampling capture function<br>Output relay (Y relay) sampling capture function | Not use |
| Capture 1 setting | Not use capture 1 function<br>Capture function at rising edge of control 0 signal<br>Capture function at trailing edge of control 0 signal<br>Capture function at rising edge of control 1 signal<br>Capture function at trailing edge of control 1 signal | Not use |
| Sampling capture function operation setting | One operation/Continuous operation | One operation |
| Sampling time | 1 to 65,535 ms | 1ms |

(Note 1): When the sampling capture function has been selected in the capture 0 setting, the capture 1 setting is invalid.

## ■ Interrupt function (Settable for each channel)

| item | Description | | Default |
|---|---|---|---|
| Interrupt function enable/disable setting | Comparison match 0 flag | Enable/Disable | Enable |
| | Comparison match 1 flag | Enable/Disable | Enable |

(Note 1): Use the dip switches on the side of the unit to enable the interrupt function.

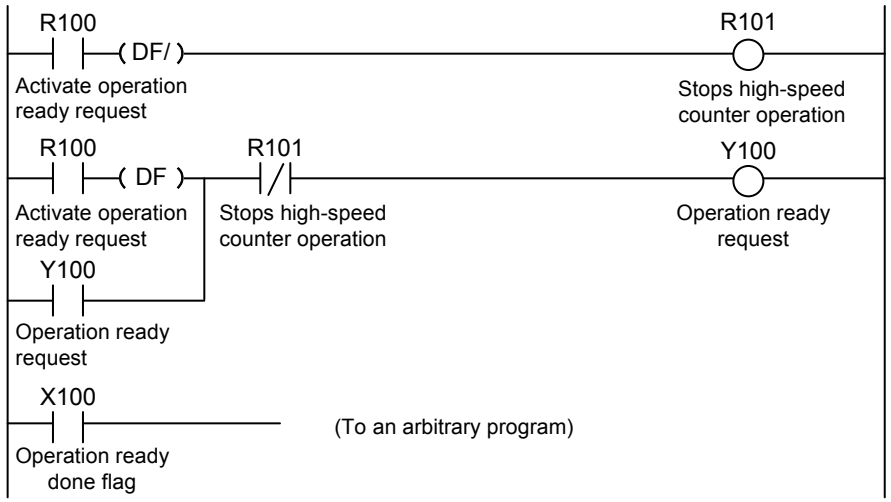
# 4.3 Configuration Data and Operation Ready Request

## 4.3.1 Operation Ready Request Program

- For enabling the settings of the high-speed counter unit, the operation ready request program should be executed.
- After downloading a project, insert the program to make it be executed early in the process.

■ **Operation ready request program**

Example) Program to request the preparation of the CH0 operation of the high-speed counter unit installed in the slot 1




■ **Allocation of I/O signals**

| Signal name | Effective condition | CH0 | CH1 | CH2 | CH3 |
|---|---|---|---|---|---|
| Operation ready request | Level | Y100 | Y110 | Y120 | Y130 |
| Operation ready done flag | - | X100 | X120 | X140 | X160 |

(Note 1): The above I/O numbers are those for the slot number 1 and the starting word number 10. The I/O numbers actually used vary according to the slot number where the unit is installed and the starting word number.

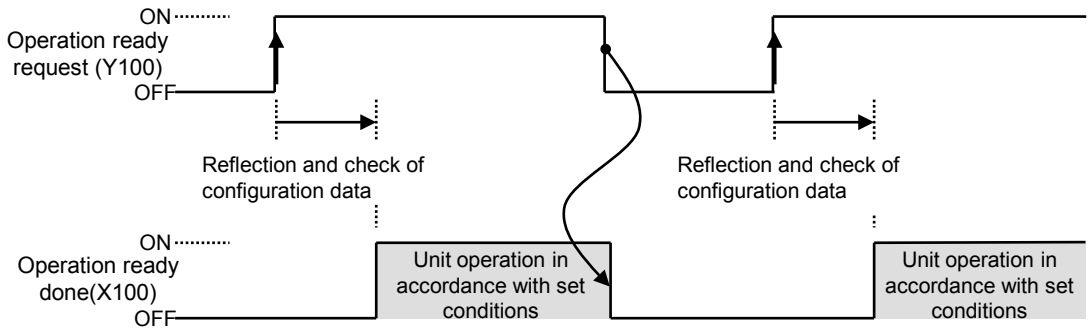
### 4.3.2 Downloading Configuration Data

- The configuration information of the high-speed counter unit is downloaded to the CPU together with user programs.
- The above programs are executed in the RUN mode, and each function of the high-speed counter unit will be enabled once the operation ready done flag turns on.

### 4.3.3 Operation When Operation Ready Request Program is Executed

- The operation ready done flag will be on when the operation ready request program is executed and each operation set in the unit becomes executable.

■ **Operation of operation ready request flag**




◆ **KEY POINTS**

- **When an error occurs, such as an abnormality in the settings of parameters, the operation ready done flag will not be turned on.**

# 4.4 Configuration Using User Programs

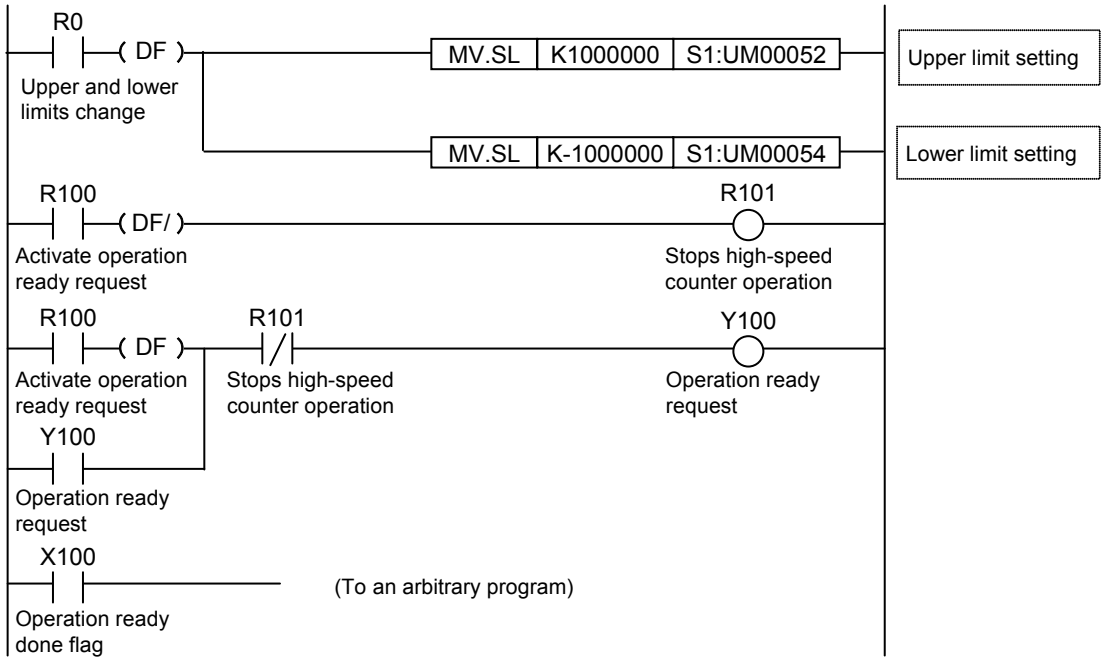
Configuration information can be rewritten using user programs.

■ **Overview of function**

- The values of configuration information are stored in unit memories (UM) in which arbitrary parameters are set. The values will be updated by turning on the operation ready request flag (Y0) when you want to reflect them in the configuration.
- If the configuration information is updated, the operation ready done flag (X0) will be on.

■ **Sample program**

Program to change the upper and lower limits of CH0 of the high-speed counter unit installed in the slot 1 using user programs




■ **Allocation of I/O signals**

| Signal name | Effective condition | CH0 | CH1 | CH2 | CH3 |
|---|---|---|---|---|---|
| Operation ready request | Level | Y100 | Y110 | Y120 | Y130 |
| Operation ready done flag | - | X100 | X120 | X140 | X160 |

(Note 1): The above I/O numbers are those for the slot number 1 and the starting word number 10. The I/O numbers actually used vary according to the slot number where the unit is installed and the starting word number.

☛ next page

## ◆ KEY POINTS

- **The configuration using user programs can be changed even when the counter is running. However, the changed values will not be effective until the operation ready done flag (X0) is turned on.**
- **The operation ready request can be executed for each channel regardless whether it has been executed in other channels or not.**

# 5

# Count Function

# 5.1 Selection of Counters and Basic Settings

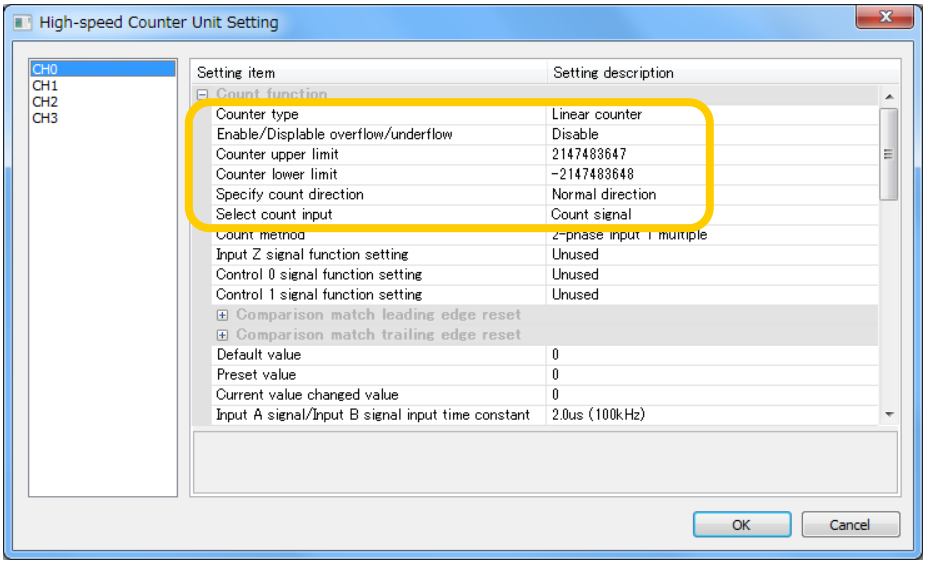
## 5.1.1 Basic Settings of Counters

The basic settings are set in the configuration menu of FPWIN GR7 or unit memories (UM).

■ **Count function configuration**

| Item | Description | Default |
|---|---|---|
| Counter type | Linear counter/Ring counter | Linear counter |
| Enable/Disable overflow/underflow | Disable/Enable | Disable |
| Counter upper limit | -2,147,483,647 to 2,147,483,647 | 2,147,483,647 |
| Counter lower limit | -2,147,483,648 to 2,147,483,646 | -2,147,483,648 |
| Specify count direction | Normal direction/Reverse direction | Normal direction |
| Select count input | Count signal / Internal clock 0.25 us (4 MHz) / Internal clock 1.00 us (1 MHz) / Internal clock 10us (100 kHz) / Internal clock 100 us (10 kHz) | Count signal |
| Count method | 2-phase input 1 multiple, 2-phase input 2 multiple, 2-phase input 4 multiple, Individual input 1 multiple, Individual input 2 multiple, Direction detection input 1 multiple, Direction detection input 2 multiple | 2-phase input 1 multiple |

■ **Example of settings by FPWIN GR7**



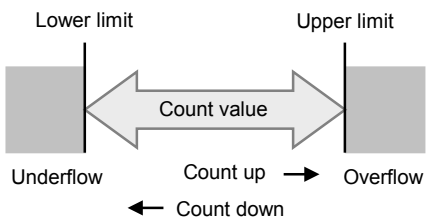
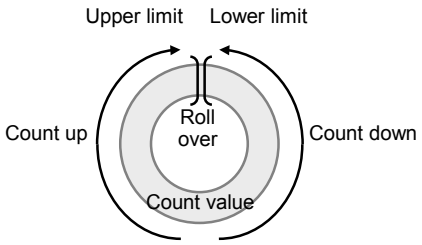

## 5.1.2 Selection of Count Input

- Select the count input to import input signals from an external device.
- For measuring the frequencies of external input signals or time based on the internal clock of the unit, select "Internal clock".

### 5.1.3 Linear Counter and Ring Counter

The operation changes depending on the types of counter as below.

■ **Operational difference between the counter types**

| Comparison item | Linear counter | Ring counter |
|---|---|---|
| Operation image |  |  |
| Operation when reaching the upper limit or lower limit | If the count value exceeds the upper limit, the upper limit will be held.<br>If the count value falls below the lower limit, the lower limit will be held.<br>(Note 1) (Note 2) | If the count value exceeds the upper limit, the count value will be the lower limit automatically and the count operation will continue.<br>If the count value falls below the lower limit, the count value will return to the upper limit automatically and the count operation will continue.<br>(Note 1) |
| Overflow and underflow settings | It can be announced as an error by the setting of configuration menu.<br>If the lower limit or the upper limit has been set using the configuration menu, an error is announced based on the set values. | Not settable. |

(Note 1): When the upper limit or the lower limit has been changed in the configuration menu, the counter operates based on its range.

(Note 2): Even when the upper and lower limits have been set on the linear counter, counting continues up to the range that is countable as a system (-2,147,483,648 to 2,147,483,647) if the overflow and under flow settings have been set to "Disable".

■ **Operation in case of overflow or underflow (Linear counter only)**

- When "Enable" has been selected in the configuration menu, the error will be announced once the overflow or underflow annunciation flag turns on.
- The overflow or underflow flag can be cleared by the following operations; Overflow clear request, Underflow clear request, Reset or Preset operation
- The error clear operation is required to clear error flags.

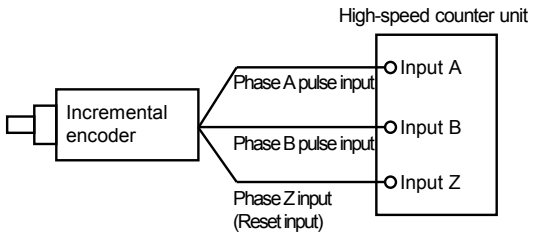
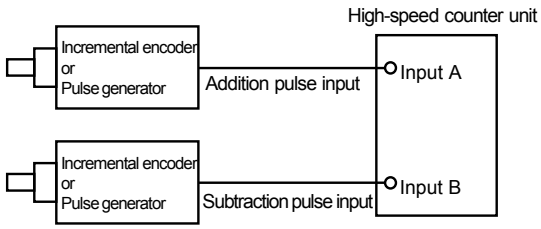
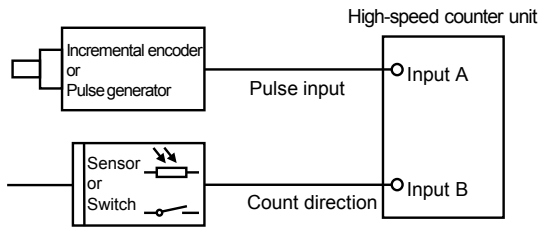
◆ **REFERENCE**

- **For details of the error clear method, refer to 10.1 Self-diagnostic Function.**

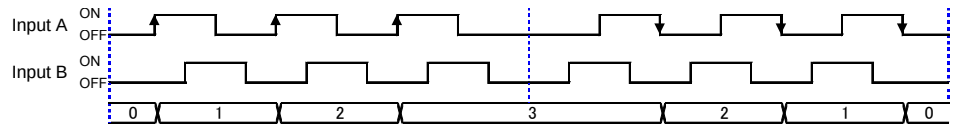
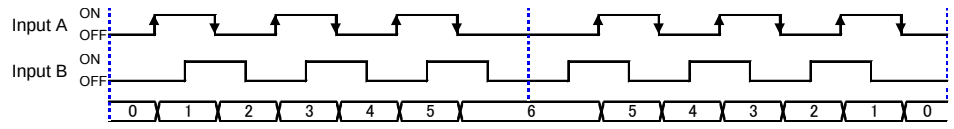
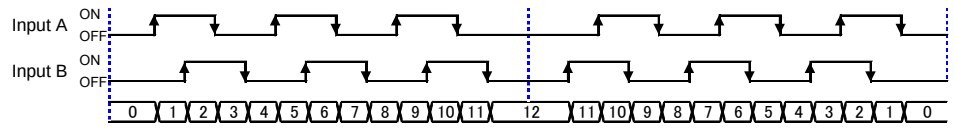
## 5.1.4 Selection of Count Methods

- Select from the following three types according to input devices to be connected.
- The count operation varies depending on the settings of multiplication factor as shown in the next page.

■ **Count method**

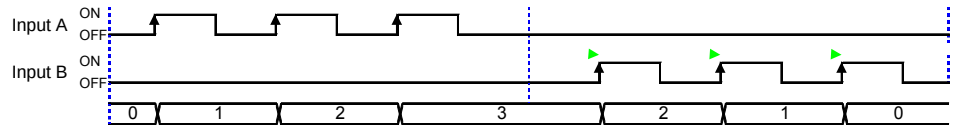
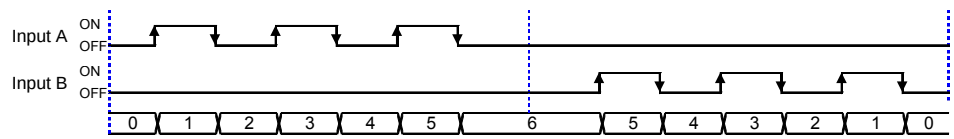
| Method | Connection | Count |
|---|---|---|
| 2-phase<br>(Phase difference) |  | For the 2-phase input, the input A signal and input B signal of each counter are connected to the phase A and phase B of an encoder.<br>The count direction depends on the phase difference between phases A and B. When the phase A is proceeding by 90 degrees in electrical angle than the phase B, the count value is incremented. When the phase A is delayed by 90 degrees in electrical angle than the phase B, the count value is decremented. |
| Individual |  | In the individual input method, the counter is incremented when the input A signal rises or falls, and decremented when the input B signal rises or falls. |
| Direction detection |  | For the direction detection input, the count signal is connected to the input A signal. The count direction is controlled by the level of the direction signal of input B signal.<br>When the input B signal is on, the counter is incremented when the input A signal rises or falls. When the input B signal is off, the counter is decremented. |

## ■ Count operation of 2-phase input (Phase difference input)

| Multiplication factor | Time chart | |
|---|---|---|
| | Addition | Subtraction |
| 1 multiple |  | |
| 2 multiple |  | |
| 4 multiple |  | |

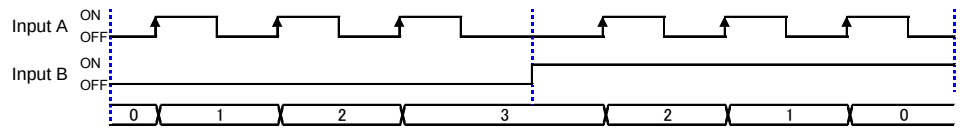
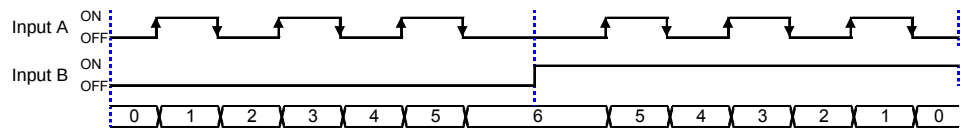


## ■ Count operation of individual input

| Multiplication factor | Time chart | |
|---|---|---|
| | Addition | Subtraction |
| 1 multiple |  | |
| 2 multiple |  | |



## ■ Count operation of direction detection input

| Multiplication factor | Time chart | |
|---|---|---|
| | Addition | Subtraction |
| 1 multiple |  | |
| 2 multiple |  | |

# 5.2 Types of Count Operations

## 5.2.1 Types and Features of Count Operations

### ■ Types of count operations and input signals

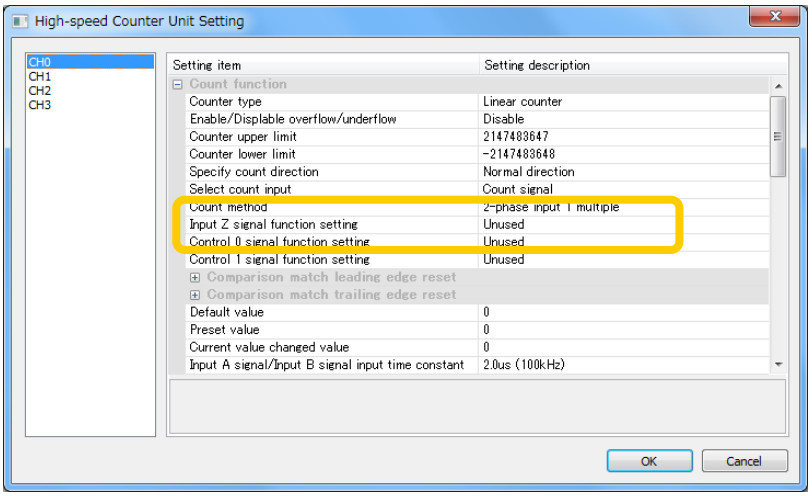
| Operation Type | Feature | External input signal used | | |
|---|---|---|---|---|
| | | Z-phase input signal | Control 0 signal | Control 1 signal |
| Simple count operation | Performs the count operation regardless of external control input signals. | | | |
| Reset count operation | Performs the reset operation according to the change in the z-phase input signal (rising, trailing, positive logic or negative logic). | ● | | |
| Preset count operation | Performs the preset operation according to the change in the z-phase input signal (rising, trailing, positive logic or negative logic). | ● | | |
| Enable count operation | Performs the count operation while the control signal allocated to the enable input is effective. | | ● | ● |
| Enable reset count operation | Performs the count operation while the control signal allocated to the enable input is effective. Resets the count value at the timing at which the counter becomes enabled by the control signal allocated to the enable input. | | ● | |
| Enable preset count operation | Performs the count operation while the control signal allocated to the enable input is effective. Presets the count value at the timing at which the counter becomes enabled by the control signal allocated to the enable input. | | ● | |

(Note 1): In any of these cases, resetting or presetting values can be performed by output relays (Y).

(Note 2): If the control signals are used in the above operations, the same signals cannot be used for the capture function or sampling chapture function.

(Note 3) To enable the count input when selecting the simple count operation, reset count operation or preset count operation, it is necessary to turn on the count enable request signal (Y1) in user programs.

### ■ Example of settings by FPWIN GR7

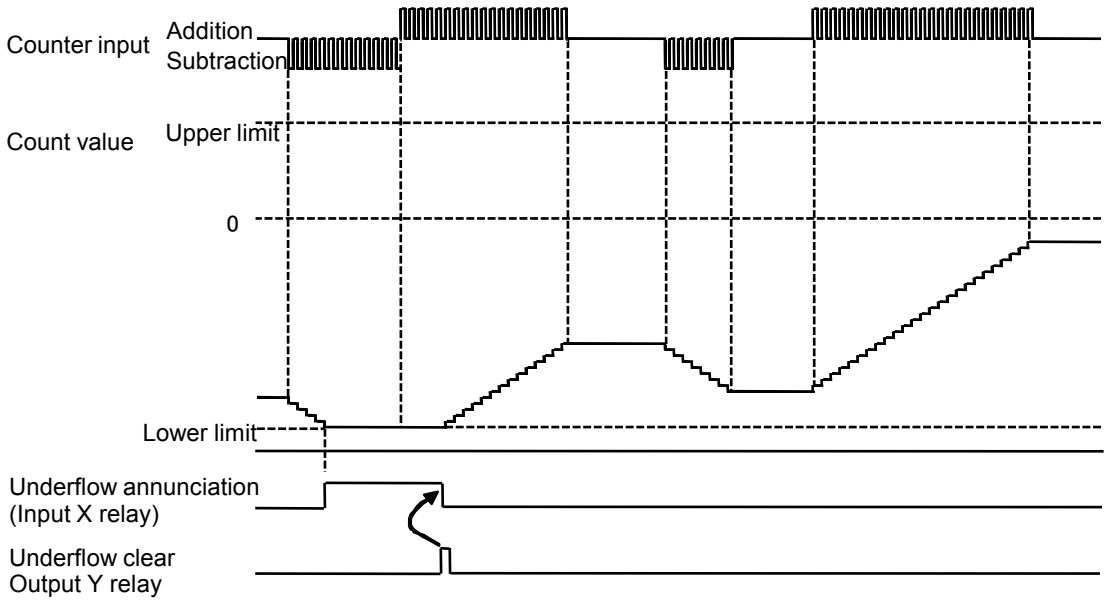


### 5.2.2 Simple Count Operation

- Simply counts count input signals.
- To enable the count input, it is necessary to turn on the count enable request signal (Y1) in user programs.

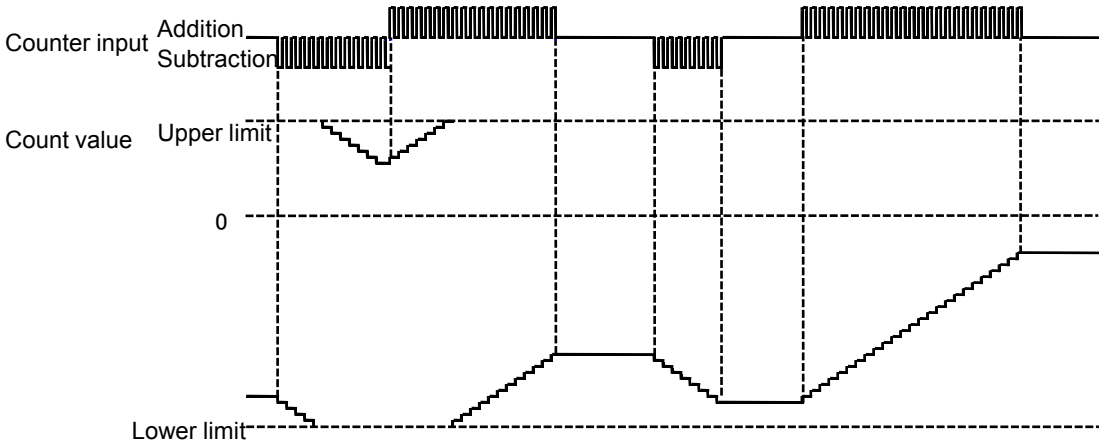
■ **Linear counter**

The overflow and underflow annunciation can be set for the cases when the count value exceeds the upper limit or the lower limit.



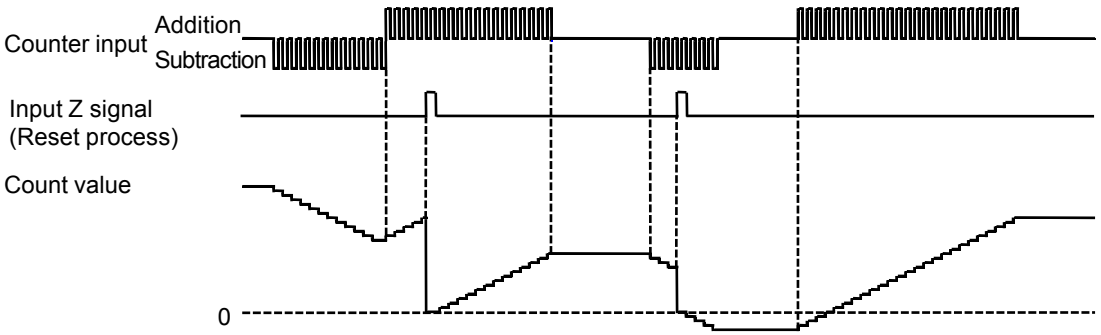

■ **Ring counter**

- If the lower limit is counted down, the count value will be rolled over, and counting down will continue from the upper limit.
- If the upper limit is counted up, the count value will be rolled over, and counting up will continue from the lower limit.


Counter input
Addition
Subtraction
Count value
Upper limit
0
Lower limit

### 5.2.3 Reset Count Operation

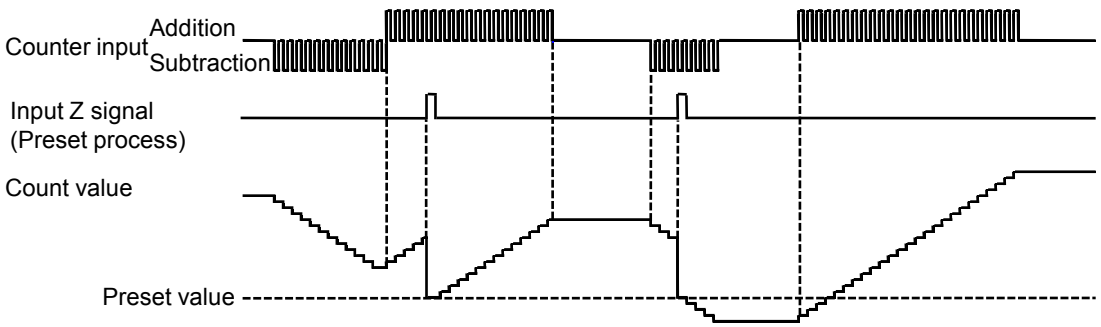
- Resets the count value to zero by the input Z signal.
- To enable the count input, it is necessary to turn on the count enable request signal (Y1) in user programs.




-

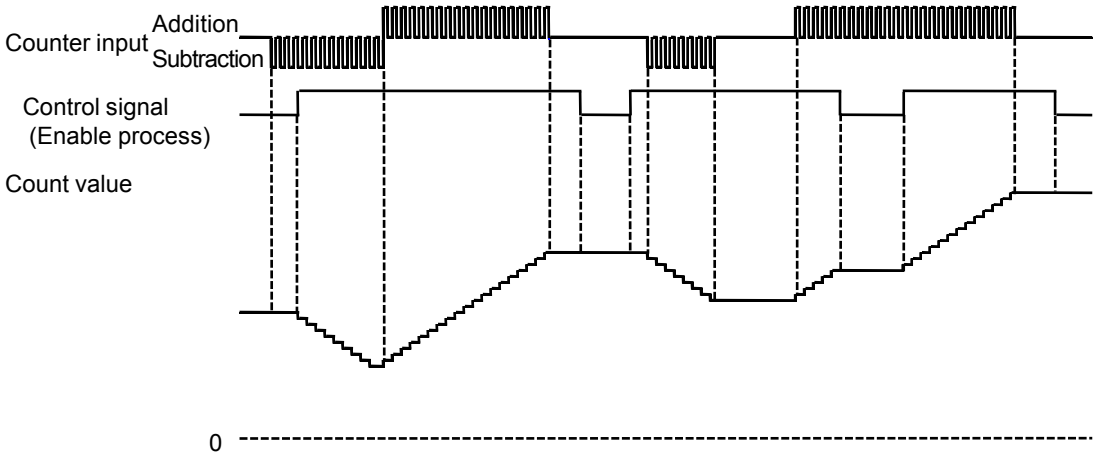
### 5.2.4 Preset Count Operation

- The preset count operation is allocated to the input Z signal and is used to change the current value of the counter to the preset value.
- To enable the count input, it is necessary to turn on the count enable request signal (Y1) in user programs.
- It can be also used for starting the counter operation from the preset value.
- The preset value is set in the configuration menu or unit memory (UM) area.



### 5.2.5 Enable Count Operation

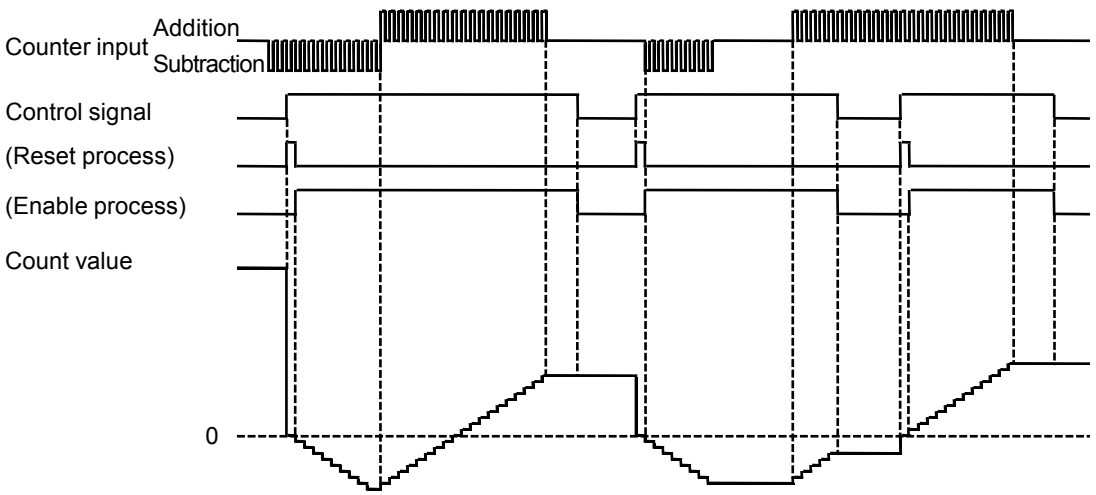
- The enable function is allocated to the control signal for using the enable count operation.
- Performs the count operation while the control signal is effective.



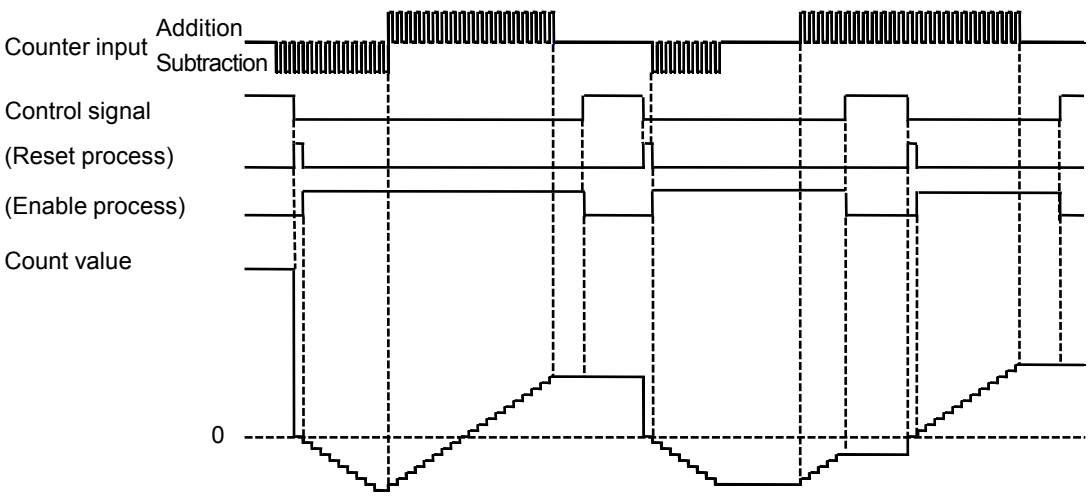
### 5.2.6 Enable Reset Count Operation

- The enable reset count operation is the operation that the enable and reset functions are allocated to the control signal.
- Resets the count value to zero when the counter becomes enabled by the change in the control signal.

■ **Positive logic enable operation and reset operation at rising edge**



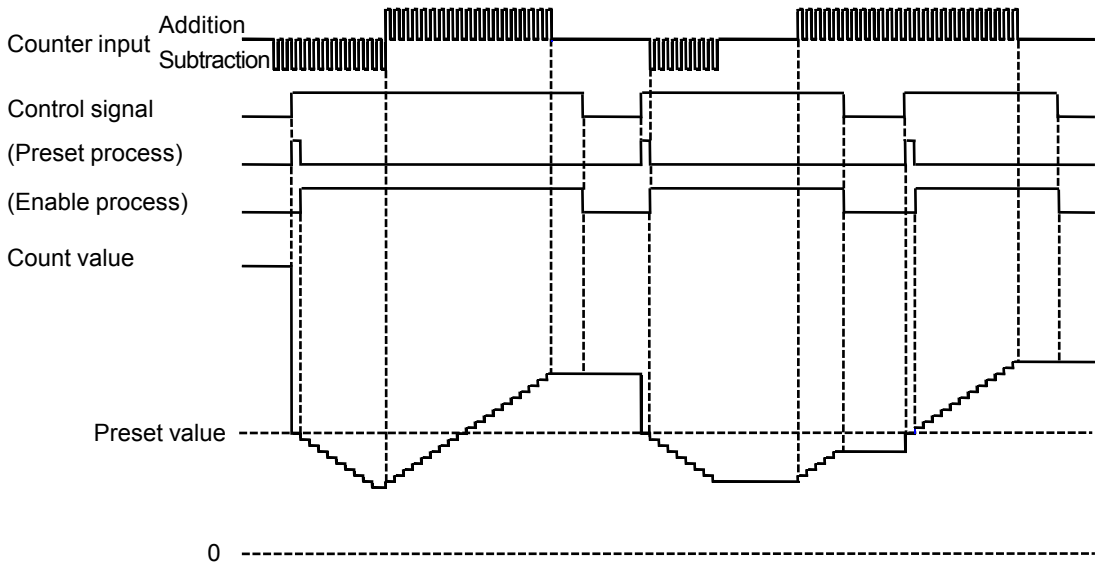

■ **Negative logic enable operation and reset operation at trailing edge**



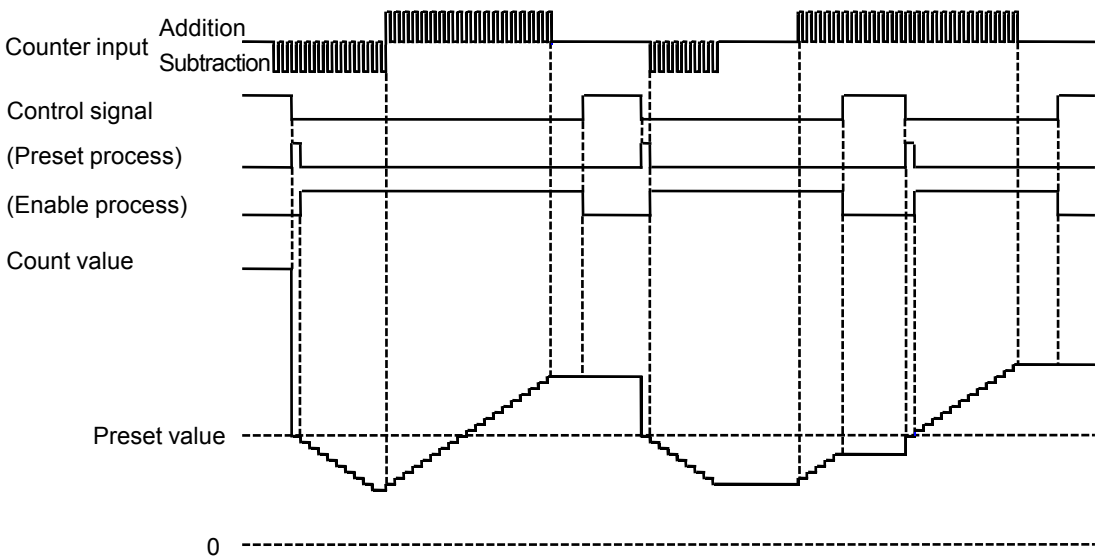
## 5.2.7 Enable Preset Count Operation

- The enable preset count operation is that the enable and preset functions are allocated to the control signal.
- Resets the count value to a specified preset value when the counter becomes enabled by the change in the control signal.

■ **Positive logic enable operation and preset operation at rising edge**



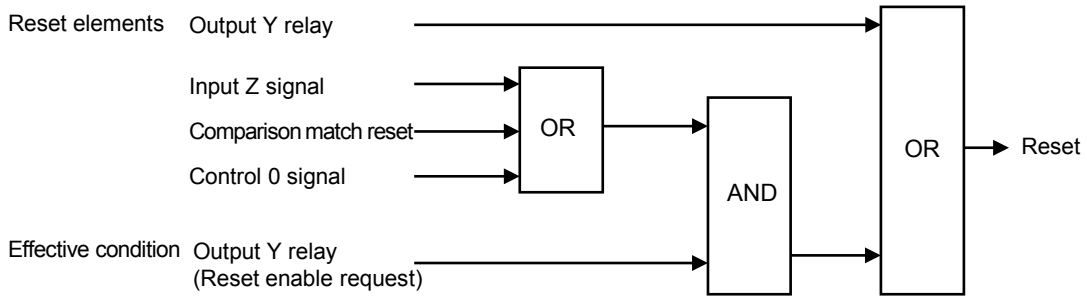

■ **Negative logic enable operation and preset operation at trailing edge**



# 5.3 Allocation of Reset, Preset and Enable Signals

## 5.3.1 Reset Input

The following four reset methods are available.




■ **Type of reset signals**

| Reset element | Setting method | Reset condition | | | |
|---|---|---|---|---|---|
| | | ON ····· OFF ↑ | ON ↓ OFF ····· | ON ··· OFF ▁▁ | ON ▁▁ OFF ··· |
| Output Y relay | Activates the reset request signal by a user program. | ● | | | |
| Input Z signal | Allocates the Z-phase input signal to any reset operation using the configuration menu. | ● | ● | ● | ● |
| Control 0 signal | Allocates the control 0 signal to either reset operation using the configuration menu.<br>Positive logic enable operation and reset operation at rising edge<br>Negative logic enable operation and reset operation at trailing edge | ● | ● | | |
| Comparison match flag | Allocates the comparison match flag operation to "Reset execution" using the configuration menu. | ● | ● | | |

■ **I/O allocation**

| Signal name | Effective condition | CH0 | CH1 | CH2 | CH3 |
|---|---|---|---|---|---|
| Reset request | ON edge | Y102 | Y112 | Y122 | Y132 |
| Reset enable request | Level | Y104 | Y114 | Y124 | Y134 |
| Input Z signal monitor | - | X10A | X12A | X14A | X16A |
| Control 0 signal monitor | - | X10B | X12B | X14B | X16B |
| Comparison match flag | - | X110-X11F | X130-X13F | X150-X15F | X170-X17F |

(Note 1): The above I/O numbers are those for the slot number 1 and the starting word number 10. The I/O numbers actually used vary according to the slot number where the unit is installed and the starting word number.

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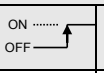
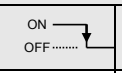
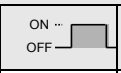
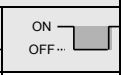
◆ KEY POINTS

- **For using the Z-phase signal, control signal or comparison match flag as reset signals, turn on the reset enable request signal using user programs.**

## 5.3.2 Preset Input

The following three preset methods are available.

■ **Type of reset signals**

| Preset element | Setting method | Preset condition | | | |
|---|---|---|---|---|---|
| | |  |  |  |  |
| Output Y relay | Activates the preset request signal by a user program. | ● | | | |
| Input Z signal | Allocates the Z-phase input signal to either preset operation using the configuration menu. | ● | ● | ● | ● |
| Control 0 signal | Allocates the control 0 signal to either reset operation using the configuration menu.<br>Positive logic enable operation and preset operation at rising edge<br>Negative logic enable operation and preset operation at trailing edge | ● | ● | | |

■ **I/O Allocation**

| Signal name | Effective condition | CH0 | CH1 | CH2 | CH3 |
|---|---|---|---|---|---|
| Preset request | ON edge | Y103 | Y113 | Y123 | Y133 |
| Input Z signal monitor | - | X10A | X12A | X14A | X16A |
| Control 0 signal monitor | - | X10B | X12B | X14B | X16B |

(Note 1): The above I/O numbers are those for the slot number 1 and the starting word number 10. The I/O numbers actually used vary according to the slot number where the unit is installed and the starting word number.

■ **Setting of preset values**

| Unit memory No. (Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00062<br>UM 00063 | Preset value | 0 | Set preset values.<br>Setting range:<br>-2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| UM 00132<br>UM 00133 | | | | |
| UM 00202<br>UM 00203 | | | | |
| UM 002D2<br>UM 002D3 | | | | |

## ◆ KEY POINTS

- **Preset values are set in unit memories (UM) using the configuration menu or user programs.**

### 5.3.3 Enable Input

The following enable input methods are available.

■ **Type of enable signals**

| Enable operation element | Setting method | Enable condition | |
|---|---|---|---|
| | | ON ··· OFF | ON OFF ··· |
| Output Y relay | Activates the enable request signal by a user program. | ● | |
| Control 0 signal | Allocates the control 0 signal to any of these operations using the configuration menu.<br>Positive logic enable operation<br>Negative logic enable operation<br>Positive logic enable operation and reset operation at rising edge<br>Negative logic enable operation and reset operation at trailing edge<br>Positive logic enable operation and preset operation at rising edge<br>Negative logic enable operation and preset operation at trailing edge | ● | ● |
| Control 1 signal | Allocates the control 1 signal to either operation using the configuration menu.<br>Positive logic enable operation<br>Negative logic enable operation | ● | ● |

■ **I/O Allocation**

| Signal name | Effective condition | CH0 | CH1 | CH2 | CH3 |
|---|---|---|---|---|---|
| Enable request | Level | Y101 | Y111 | Y121 | Y131 |
| Control 0 signal monitor | - | X10B | X12B | X14B | X16B |
| Control 1 signal monitor | - | X10C | X12C | X14C | X16C |

(Note 1): The above I/O numbers are those for the slot number 1 and the starting word number 10. The I/O numbers actually used vary according to the slot number where the unit is installed and the starting word number.

◆ **KEY POINTS**

- **The enable input works as a level signal.**

# 5.4 Reading Count Value and Changing Current Value

## 5.4.1 Areas Related to Count Value

■ **Monitor area related to count values**

| Unit memory No. (Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 003A0<br>UM 003A1 | Count value<br>Current value | 0 | Current count value of counter<br>Setting range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| UM 003B0<br>UM 003B1 | | | | |
| UM 003C0<br>UM 003C1 | | | | |
| UM 003D0<br>UM 003D1 | | | | |

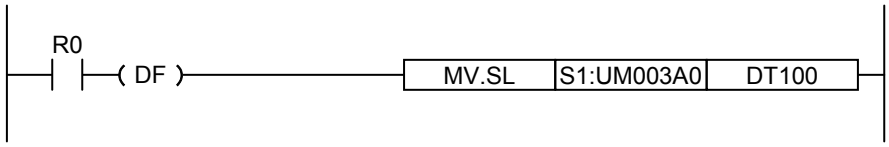
■ **Configuration area related to count value**

| Unit memory No. (Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00060<br>UM 00061 | Default value (when power turns on) | 0 | Set the default value used when the power turns on.<br>Setting range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| UM 00130<br>UM 00131 | | | | |
| UM 00200<br>UM 00201 | | | | |
| UM 002D0<br>UM 002D1 | | | | |
| UM 00062<br>UM 00063 | Preset value | 0 | Set the preset value for using the preset count function.<br>Setting range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| UM 00132<br>UM 00133 | | | | |
| UM 00202<br>UM 00203 | | | | |
| UM 002D2<br>UM 002D3 | | | | |
| UM 00064<br>UM 00065 | Current value changed value | 0 | Set the changed value to change the current value of counter.<br>Setting range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| UM 00134<br>UM 00135 | | | | |
| UM 00204<br>UM 00205 | | | | |
| UM 002D4<br>UM 002D5 | | | | |

## 5.4.2 Reading Count Value

- The count value (current value) can be read from the monitor area.

Example) Program to change the current value of CH0 of the high-speed counter unit



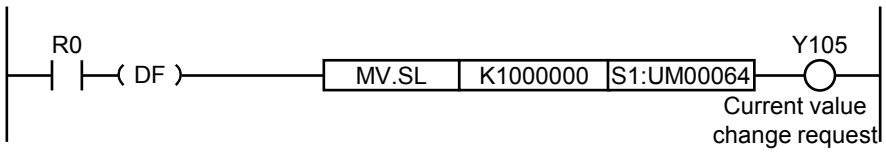

## 5.4.3 Count Value When Power Turns On

- The count value when the power turns on can be set to any value as necessary. Set the default value (when the power turns on) using the configuration menu of tool software FPWIN GR7 or user programs.
- The default for the count value when the power turns on is "0".

## 5.4.4 Changing Count Current Value

- The count current value can be set to any value as necessary.
- Set a value in the current value changed value area using the user program and turn on the current value change request signal.

Example) Program to change the current value of CH0 of the high-speed counter unit to 1000000




■ **Allocation of I/O Numbers**

| Signal name | Effective condition | CH0 | CH1 | CH2 | CH3 |
|---|---|---|---|---|---|
| Current value change request | ON edge | Y105 | Y115 | Y125 | Y135 |

(Note 1): The above I/O numbers are those for the slot number 1 and the starting word number 10. The I/O numbers actually used vary according to the slot number where the unit is installed and the starting word number.

◆ **KEY POINTS**

- **The current value of the count value can be changed by writing an arbitrary value in the configuration area and turning on the current value change request signal. Values cannot be written in the monitor area directly.**

# 5.5 Input Time Constant Setting Function

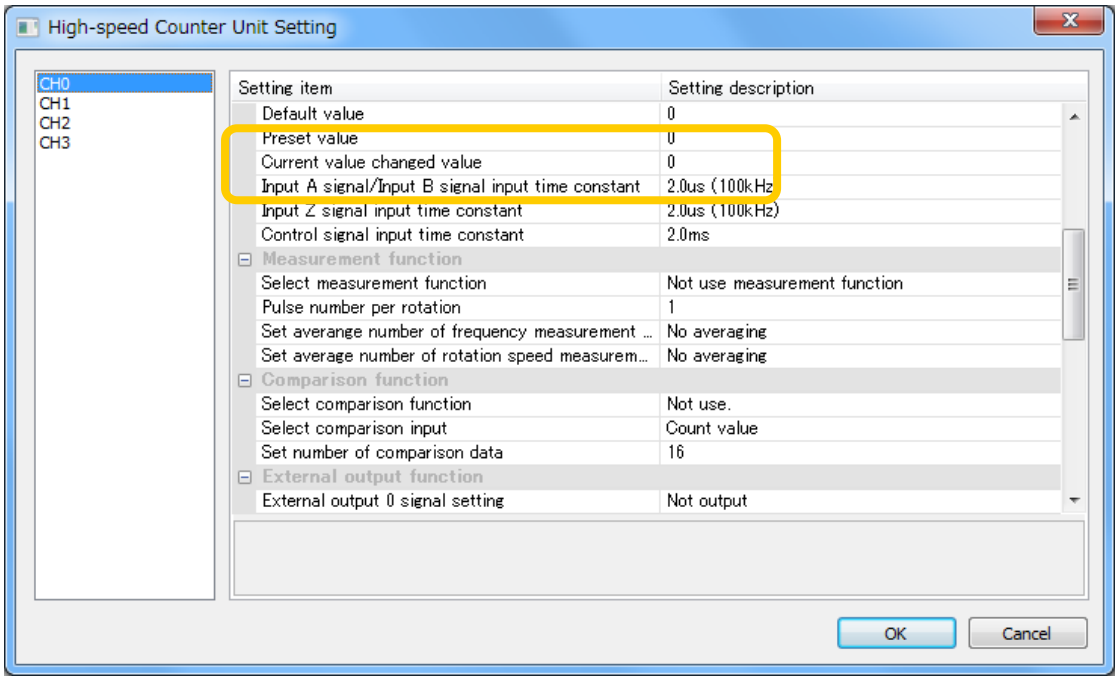
## 5.5.1 Input Time Constant

- Time constants can be set as noise filters for input signals (phases A, B and Z) and control signals.
- When selecting "No input time constant", input signals are processed without the time constant filter.

■ **Count function (Settable for each channel)**

| Setting item | Settings | Default |
|---|---|---|
| Input A signal/Input B signal input time constant | No input time constant / 0.1 us ( 2 MHz) / 0.2 us ( 1 MHz) / 0.5 us (500 kHz) / 1.0 us (250 kHz) / 2.0 us (100 kHz) / 10.0 us ( 10 kHz) | 2.0 us (100 kHz) |
| Input Z signal input time constant | | |
| Control signal input time constant | No input time constant /2 us / 5 us / 10 us / 20 us / 50 us / 100 us / 500 us / 1.0 ms / 2.0 ms / 5.0 ms / 10.0 ms | 2.0 ms |

■ **Example of settings by FPWIN GR7**



# 6

# Measurement Function

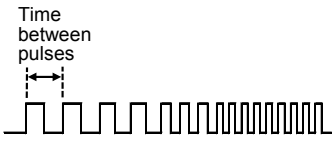
# 6.1 Overview of Measurement Function

## 6.1.1 Types of Measurement Function

■ **Measurement function**

- The measurement function is to measure the changes in the count values of the high-speed counter and to output them as frequencies or number of rotations.
- Measuring results are stored in unit memories (UM). They can be read by user programs if necessary.

■ **Types of measurement function**

| Type | Operation image | Feature |
|---|---|---|
| Frequency measurement function | | Measures the time in which the count value changes, and calculates the frequency.<br>Frequency (Hz) = 1/Time between pulses (s)<br>When there is no change in the count value for one second, the result is 0 Hz. |
| Rotation speed measurement A function |  | Calculates a rotation speed (rpm) from the time interval of the change in the counter and the specified pulse number per rotation, and stores the measuring result after averaging in the unit memory (UM).<br>Any number can be set for the number of averaging.<br>Measures the time interval of the change in the counter, and calculates the rotation speed (rpm).<br>Rotation speed (rpm) = 60/(Time between pulses x Number of pulses per rotation)<br>The rotation speed measurement A function can be used for the case such as the interval of the change in the counter is large (low-speed pulse).<br>When there is no change in the count value for one second or more, the result is 0 rpm. |
| Rotation speed measurement B function | | Automatically calculates a rotation speed (rpm) from the time interval of the change in the counter and the specified pulse number per rotation, and stores the measuring result after averaging in the unit memory.<br>Any number can be set for the number of averaging.<br>Measures the time which counts the specified pulse number per rotation, and calculates the rotation speed per rotation (rpm).<br>Rotation speed (rpm) = 60/(Time taken for one rotation)<br>The rotation speed measurement B function can be used for the case such as the time interval of the change in the counter is not even. However, when it takes for one second or more for one rotation, the result is 0 rpm. |

◆ **KEY POINTS**

- **When the measurement function has been selected in the configuration area, the measuring operation starts once the operation ready done flag turns on.**

## 6.1.2 Configuration

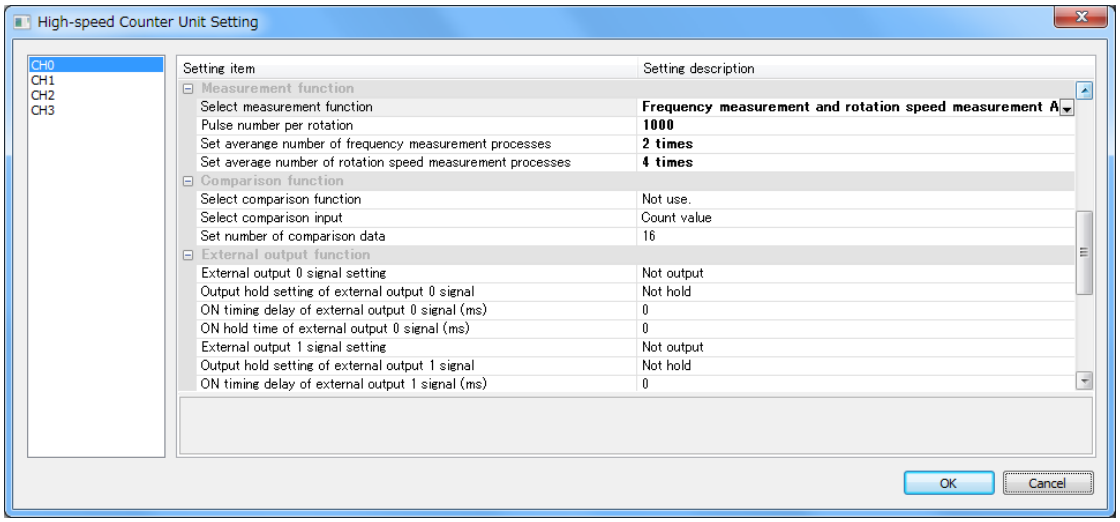
For using the measurement function, set the following items using the configuration menu of tool software FPWIN GR7 or user programs.

■ **Setting area**

| Unit memory No. (Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00070<br>UM 00140<br>UM 00210<br>UM 002E0 | Select measurement function | H0 | H0: Not use measurement function<br>H1: Frequency measurement<br>H2: Frequency measurement and rotation speed measurement A<br>H3: Frequency measurement and rotation speed measurement B | — |
| UM 00071<br>UM 00072<br>UM 00141<br>UM 00142<br>UM 00211<br>UM 00212<br>UM 002E1<br>UM 002E2 | Pulse number per rotation | U1 | Set the pulse number for one rotation of the encoder.<br>Setting range: 1 to 1,048,575 (The values out of the setting range are invalid.) | Pulse |
| UM 00073<br>UM 00143<br>UM 00213<br>UM 002E3 | Set averange number of frequency measurement processes | H0 | Set the number of averaging of frequency measurement values.<br>H0: No averaging, H1: 2 times, H2: 4 times, H3: 8 times, H4: 16 times, H5: 32 times, H6: 64 times, H7: 128 times | Times |
| UM 00074<br>UM 00144<br>UM 00214<br>UM 002E4 | Set average number of rotation speed measurement processes | H0 | Set the number of averaging of rotation speed measurement values.<br>H0: No averaging, H1: 2 times, H2: 4 times, H3: 8 times, H4: 16 times, H5: 32 times, H6: 64 times, H7: 128 times | Times |

(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

■ **Example of settings by FPWIN GR7**



## 6.1.3 Reading Measuring Results

Measuring results are stored in the following area.

■ **Read area**

| Unit memory No. (Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 003A8<br>UM 003A9 | Frequency measurement value<br>(After averaging) | U0 | Frequency measurement value after averaging procedure<br>Range: 0 to 20,000,000<br>Signed 32-bit | Hz |
| UM 003B8<br>UM 003B9 | | | | |
| UM 003C8<br>UM 003C9 | | | | |
| UM 003D8<br>UM 003D9 | | | | |
| UM 003AA<br>UM 003AB | Rotation speed measurement value<br>(After averaging) | U0 | Rotation speed measurement value after averaging procedure<br>Range: -1,200,000,000 to +1,200,000,000<br>Signed 32-bit | rpm |
| UM 003BA<br>UM 003BB | | | | |
| UM 003CA<br>UM 003CB | | | | |
| UM 003DA<br>UM 003DB | | | | |

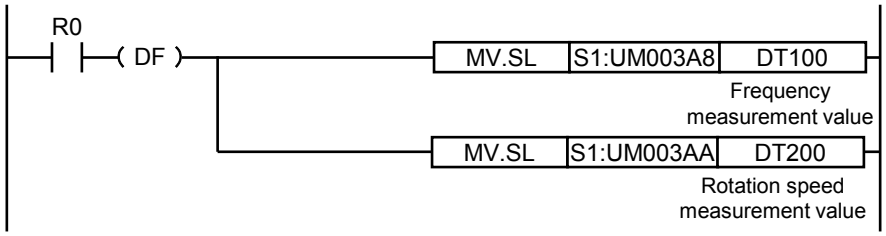
(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

## 6.1.4 Sample Program

- It can be read at any time.
- The values stored in unit memories can be monitored by the device monitor function of programming tool FPWIN GR7.

■ **Read program**

Example) Program to read the frequency measurement value and the rotation speed measurement value for CH0 of the high-speed counter unit installed in the slot number 1



# 7

# Comparison Function

# 7.1 Overview of Comparison Function

## 7.1.1 Types of Comparison Function

### ■ Comparison function

- Compares the current value of the high-speed counter with a specified target value, and reflects the matched value in the comparison match flag.
- There are two methods, which are the target value match comparison and the band comparison.
- Comparison results can be output to external devices from the unit.

### ■ Comparison match function specifications

| Item | Description | Remark |
|---|---|---|
| No. of comparison data | Max. 16 data per channel (Comparison data 0 ~ Comparison data 15) | |
| Comparison match flag | Max. 16 points per channel (Comparison match 0 flag to Comparison match F flag)<br>Read as input relays (X) by user programs.<br>Multiple comparison match flags can be set for single comparison data. | |
| Comparison method | Target value match comparison<br>Sets or resets the comparison match flag when the elapsed value matches the target value. | |
| | Band comparison<br>Turns on or off the comparison match flag when the elapsed value is in the range of specified lower and upper limits. | |
| External output | Max. 2 points per channel<br>The comparison match 0 flag can be allocated to the external output 0 terminal of the unit.<br>The comparison match 1 flag can be allocated to the external output 1 terminal of the unit. | |
| | The following settings are available only when the band comparison function is used.<br>ON delay timing: 0 to 1,000 ms<br>ON hold time: 0 to 1,000 ms | |
| | Forced output function<br>The outputs of external output 0 terminal and external output 1 terminal can be controlled on the ladder monitor or device monitor of tool software. | |

### ■ I/O Allocation

| Signal name | CH0 | CH1 | CH2 | CH3 |
|---|---|---|---|---|
| Comparison match flag | X110-X11F | X130-X13F | X150-X15F | X170-X17F |

(Note 1): The above I/O numbers are those for the slot number 1 and the starting word number 10. The I/O numbers actually used vary according to the slot number where the unit is installed and the starting word number.

◆ **KEY POINTS**

- **Only the comparison match 0 flag or comparison match 1 flag can be set as the external output of the high-speed counter unit.**
- **The default for the external output 0 and 1 settings is "Not output". Change the settings in the configuration menu as necessary.**
- **There is no need to arrange comparison data in ascending or descending order.**

## 7.1.2 Target Value Match Comparison and Band Comparison

- The main difference is as below.
- The comparison methods can be selected for each channel.

■ **Main difference in characteristics**

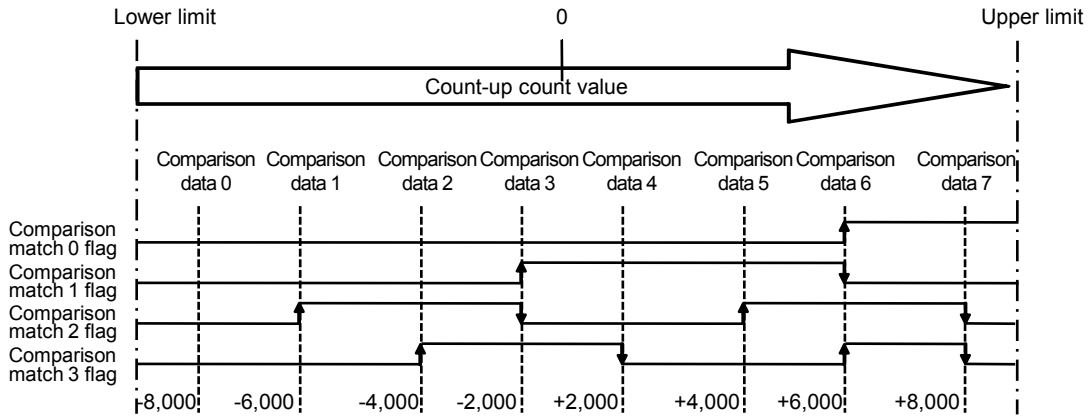
| Item | Target value match comparison | Band comparison |
|---|---|---|
| Setting of comparison value data | Comparison value data is specified as points. | Comparison value data is specified with upper and lower limits. |
| Setting when comparison value data matches | The operation when reaching the target value is selected from the following four patterns.<br>Sets when the values are matched at the time of addition.<br>Resets when the values are matched at the time of addition.<br>Sets when the values are matched at the time of subtraction.<br>Resets when the values are matched at the time of subtraction. | Specify ON or OFF for the state of the comparison match flag when the current value is in a specified band. |
| Operation when comparison value data matches | The operations when the value reaches the same comparison data may differ between the cases of addition and subtraction. | The same operation is performed for the same comparison data in the cases of both addition and subtraction. |
| Time setting of external output signal | The settings listed on the right are not available. | ON delay timing: 0 to 1,000 ms<br>ON hold time: 0 to 1,000 ms<br>The ON delay timing and ON hold time can be specified in combination. |

# 7.2 Operation of Target Value Match Function

## 7.2.1 Examples of Linear counter Settings

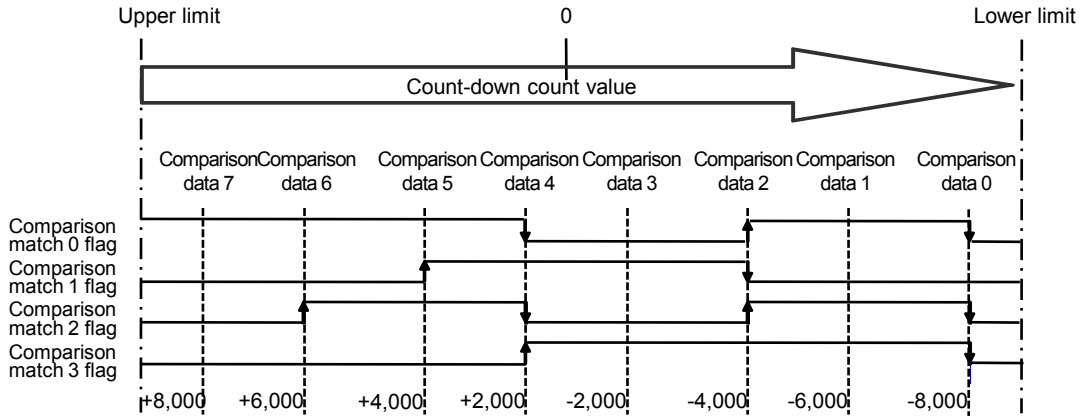
■ **Example of comparison match flag operation when counting up.**

Operates according to the settings of addition set pattern and addition reset pattern when the current value matches the comparison data.




■ **Example of comparison match flag operation when counting down.**

Operates according to the settings of subtraction set pattern and addition reset pattern when the current value matches the comparison data.



■ **Examples of output pattern settings**

| Comparison data | Target value | Output pattern | Comparison match 0 flag | Comparison match 1 flag | Comparison match 2 flag | Comparison match 3 flag |
|---|---|---|---|---|---|---|
| 0 | -8,000 | Addition set pattern | | | | |
| | | Addition reset pattern | | | | |
| | | Subtraction set pattern | | | | |
| | | Subtraction reset pattern | ○ | | ○ | ○ |
| 1 | -6,000 | Addition set pattern | | | ○ | |
| | | Addition reset pattern | | | | |
| | | Subtraction set pattern | | | | |
| | | Subtraction reset pattern | | | | |
| 2 | -4,000 | Addition set pattern | | | | ○ |
| | | Addition reset pattern | | | | |
| | | Subtraction set pattern | ○ | | ○ | |
| | | Subtraction reset pattern | | ○ | | |
| 3 | -2,000 | Addition set pattern | | ○ | | |
| | | Addition reset pattern | | | ○ | |
| | | Subtraction set pattern | | | | |
| | | Subtraction reset pattern | | | | |
| 4 | +2,000 | Addition set pattern | | | | |
| | | Addition reset pattern | | | | ○ |
| | | Subtraction set pattern | | | | ○ |
| | | Subtraction reset pattern | ○ | | ○ | |
| 5 | +4,000 | Addition set pattern | | | ○ | |
| | | Addition reset pattern | | | | |
| | | Subtraction set pattern | | ○ | | |
| | | Subtraction reset pattern | | | | |
| 6 | +6,000 | Addition set pattern | ○ | | | ○ |
| | | Addition reset pattern | | ○ | | |
| | | Subtraction set pattern | | | ○ | |
| | | Subtraction reset pattern | | | | |
| 7 | +8,000 | Addition set pattern | | | | |
| | | Addition reset pattern | | | ○ | ○ |
| | | Subtraction set pattern | | | | |
| | | Subtraction reset pattern | | | | |

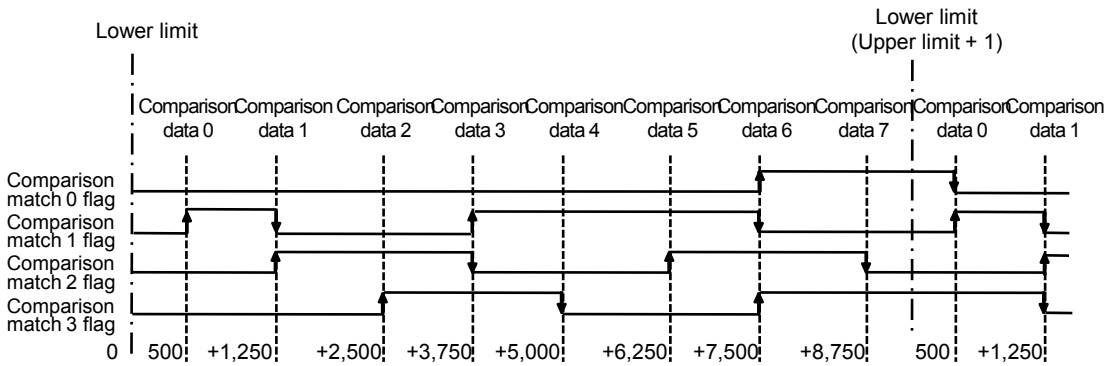
◆ **KEY POINTS**

- **The operation of comparison match flag when the count value reaches the target value can be changed depending on the cases of addition and subtraction.**
- **If the contents of comparison data 0 to 15 are overlapped and the specified reset conditions are different, the priority of data is in the following order. (High) 0 > 1 > 2 > 3 > 4 > 5 > 6 > 7 > 8 > 9 > 10 > 11 > 12 > 13 > 14 > 15 (Low)**

## 7.2.2 Examples of Ring Counter Settings

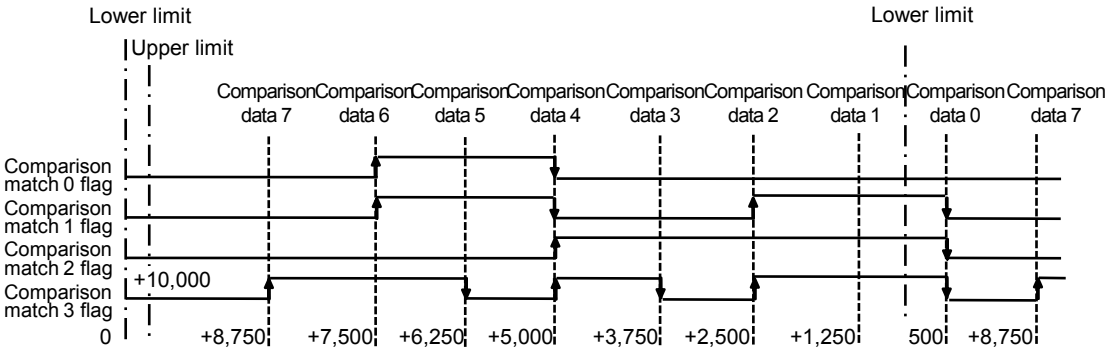
■ **Comparison match flag operation when counting up**

Operates according to the settings of addition set pattern and addition reset pattern when the current value matches the comparison data.




■ **Comparison match flag operation when counting down**

Operates according to the settings of subtraction set pattern and addition reset pattern when the current value matches the comparison data.




◆ **KEY POINTS**

- **For the ring counter, comparison data is set for the area including the upper and lower limits in which the count value is rolled over, and set patterns can be set.**

■ **Examples of output pattern settings**

| Comparison data | Target value | Output pattern | Comparison match 0 flag | Comparison match 1 flag | Comparison match 2 flag | Comparison match 3 flag |
|---|---|---|---|---|---|---|
| 0 | +500 | Addition set pattern | | ○ | | |
| | | Addition reset pattern | ○ | | | |
| | | Subtraction set pattern | | | | |
| | | Subtraction reset pattern | | ○ | ○ | ○ |
| 1 | +1,250 | Addition set pattern | | | ○ | |
| | | Addition reset pattern | | ○ | | ○ |
| | | Subtraction set pattern | | | | |
| | | Subtraction reset pattern | | | | |
| 2 | +2,500 | Addition set pattern | | | | ○ |
| | | Addition reset pattern | | | | |
| | | Subtraction set pattern | | ○ | | ○ |
| | | Subtraction reset pattern | | | | |
| 3 | +3,750 | Addition set pattern | | ○ | | |
| | | Addition reset pattern | | | ○ | |
| | | Subtraction set pattern | | | | |
| | | Subtraction reset pattern | | | | ○ |
| 4 | +5,000 | Addition set pattern | | | | |
| | | Addition reset pattern | | | | ○ |
| | | Subtraction set pattern | | | ○ | ○ |
| | | Subtraction reset pattern | ○ | ○ | | |
| 5 | +6,250 | Addition set pattern | | | ○ | |
| | | Addition reset pattern | | | | |
| | | Subtraction set pattern | | | | |
| | | Subtraction reset pattern | | | | ○ |
| 6 | +7,500 | Addition set pattern | ○ | | | ○ |
| | | Addition reset pattern | | ○ | | |
| | | Subtraction set pattern | ○ | ○ | | |
| | | Subtraction reset pattern | | | | |
| 7 | +8,750 | Addition set pattern | | | | |
| | | Addition reset pattern | | | ○ | |
| | | Subtraction set pattern | | | | ○ |
| | | Subtraction reset pattern | | | | |

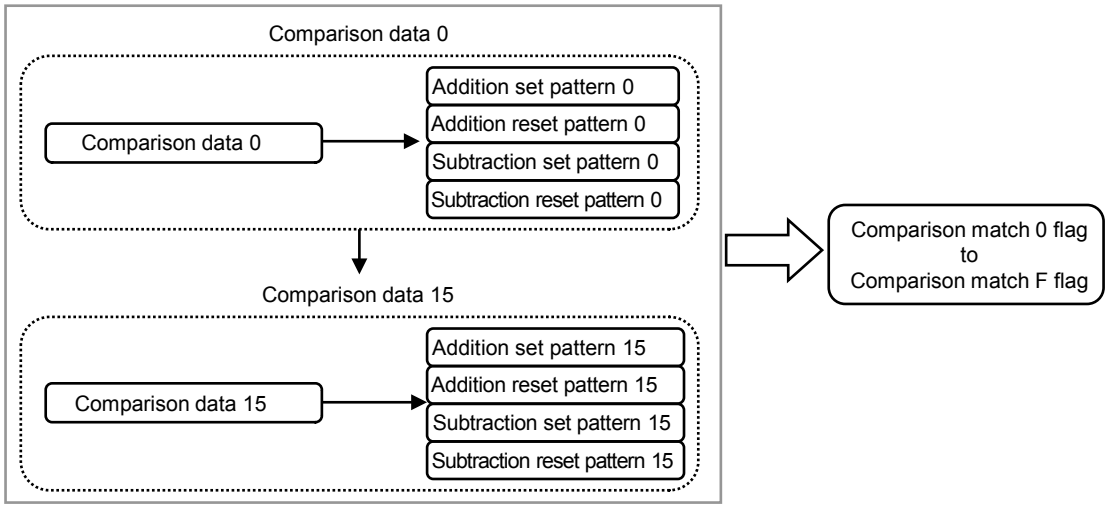
◆ **KEY POINTS**

- **The operation of comparison match flag when the count value reaches the target value can be changed depending on the cases of addition and subtraction.**
- **If the contents of comparison data 0 to 15 are overlapped and the specified reset conditions are different, the priority of data is in the following order. (High) 0 > 1 > 2 > 3 > 4 > 5 > 6 > 7 > 8 > 9 > 10 > 11 > 12 > 13 > 14 > 15 (Low)**

### 7.2.3 Configuration of Target Value Match Comparison

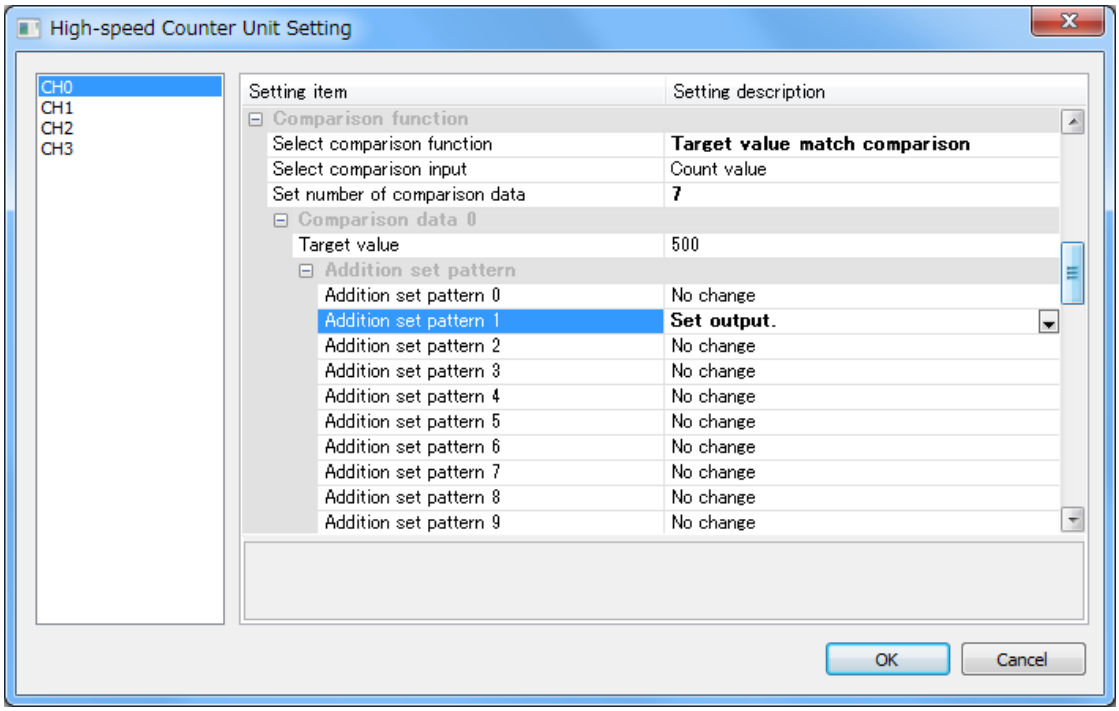
■ **Overview of setting items**

- For each comparison data, specify whether to set or reset each flag when the current value matches the target value.
- Multiple comparison match flags can be set for one comparison data.
- Different flag operations can be set depending on the count direction when the values are matched (at the time of addition or subtraction).




*Setting for Target value match comparison*

■ **Example of settings by FPWIN GR7**


High-speed Counter Unit Setting
CH0
CH1
CH2
CH3
Setting item
Setting description
Comparison function
Select comparison function
Target value match comparison
Select comparison input
Count value
Set number of comparison data
7
Comparison data 0
Target value
500
Addition set pattern
Addition set pattern 0
No change
Addition set pattern 1
Set output.
Addition set pattern 2
No change
Addition set pattern 3
No change
Addition set pattern 4
No change
Addition set pattern 5
No change
Addition set pattern 6
No change
Addition set pattern 7
No change
Addition set pattern 8
No change
Addition set pattern 9
No change
OK
Cancel

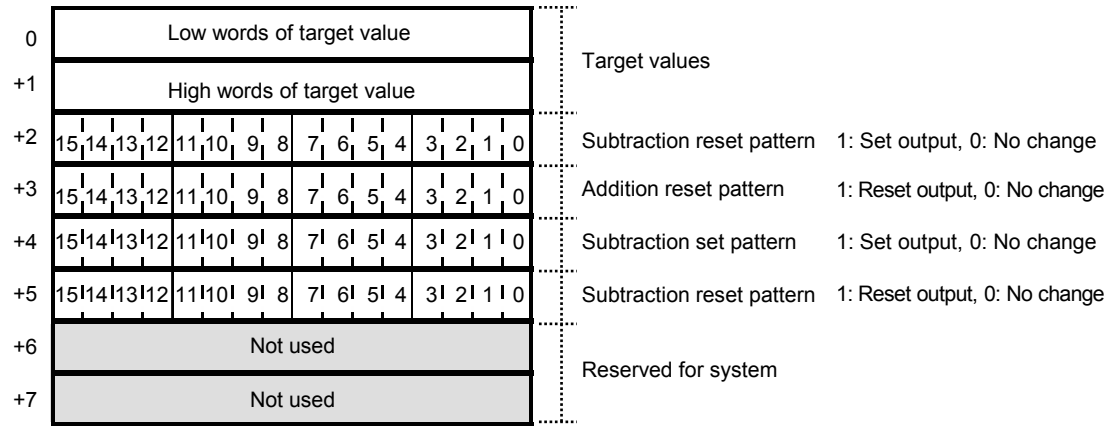
■ **Pattern of storage in unit memories (UM)**

- Set data is stored in 8-word blocks of corresponding unit memories in the following format.
- When using user programs, set data in corresponding unit memory numbers.

Example 1) For the comparison data 0 of CH0, it is allocated to UM00080 to UM00087.

Example 2) For the comparison data 1 of CH0, it is allocated to UM00088 to UM0008F.

- The bit numbers 0 to 15 in the areas of +2 to +5 in the figure below correspond to the comparison match 0 flag to F flag.


0
Low words of target value
+1
High words of target value
Target values
+2
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Subtraction reset pattern
1: Set output, 0: No change
+3
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Addition reset pattern
1: Reset output, 0: No change
+4
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Subtraction set pattern
1: Set output, 0: No change
+5
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Subtraction reset pattern
1: Reset output, 0: No change
+6
Not used
Reserved for system
+7
Not used

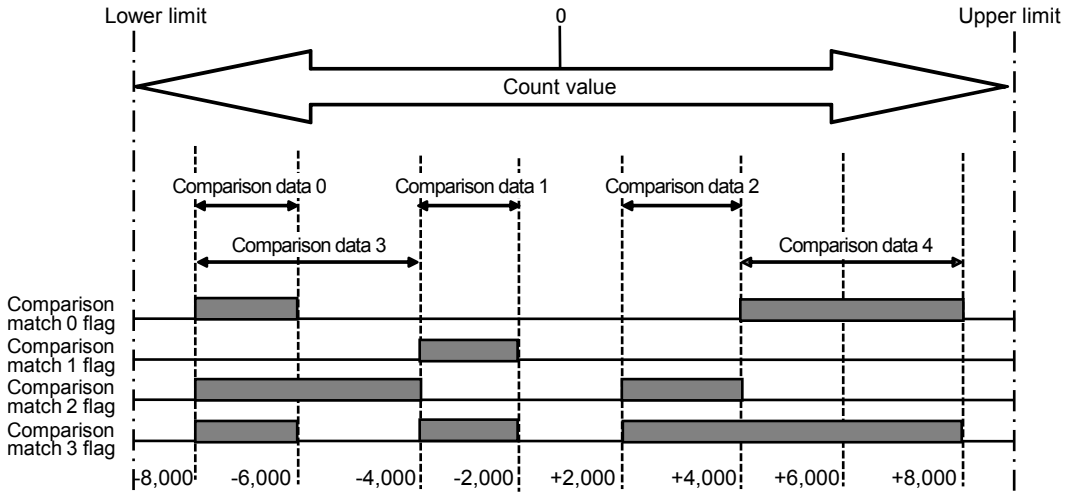
◆ **REFERENCE**

- **For details of unit memory numbers, refer to 11.4 Unit Memory Detailed Specifications.**

# 7.3 Operation of Band Comparison Function

## 7.3.1 Examples of Linear counter Settings

■ **Operation of band comparison match flag**




■ **Examples of output pattern settings**

| Comparison data | Band comparison value | | Output pattern | Comparison match 0 flag | Comparison match 1 flag | Comparison match 2 flag | Comparison match 3 flag |
|---|---|---|---|---|---|---|---|
| | Lower limit | Upper limit | | | | | |
| 0 | -8,000 | -6,000 | Set pattern | ON | OFF | ON | ON |
| 1 | -4,000 | -2,000 | Set pattern | OFF | ON | OFF | ON |
| 2 | +2,000 | +4,000 | Set pattern | OFF | OFF | ON | ON |
| 3 | -8,000 | -4,000 | Set pattern | OFF | OFF | ON | OFF |
| 4 | +4,000 | +8,000 | Set pattern | ON | OFF | OFF | ON |

◆ **KEY POINTS**

- **The output is off in the areas of the bands in which comparison data is not set.**
- **Multiple comparison data can be set for the same band.**
- **If the contents of comparison data 0 to 15 are overlapped and the specified reset conditions are different, the priority of data is in the following order. (High) 0 > 1 > 2 > 3 > 4 > 5 > 6 > 7 > 8 > 9 > 10 > 11 > 12 > 13 > 14 > 15 (Low)**

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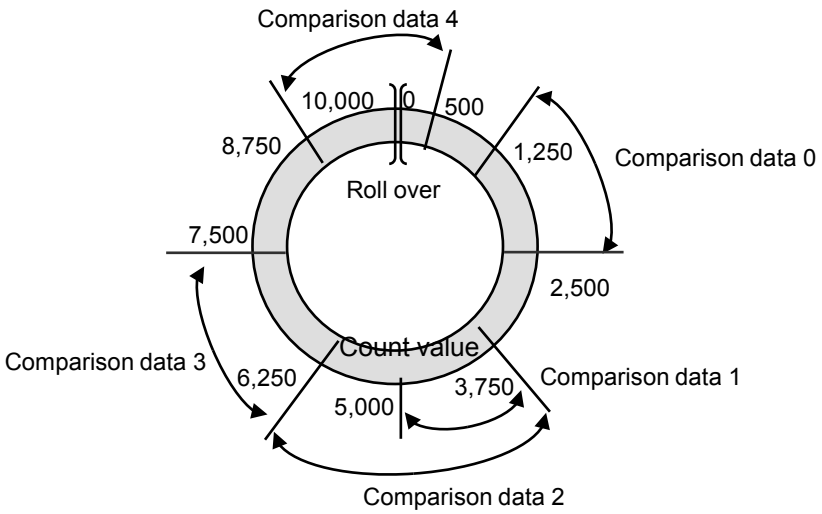
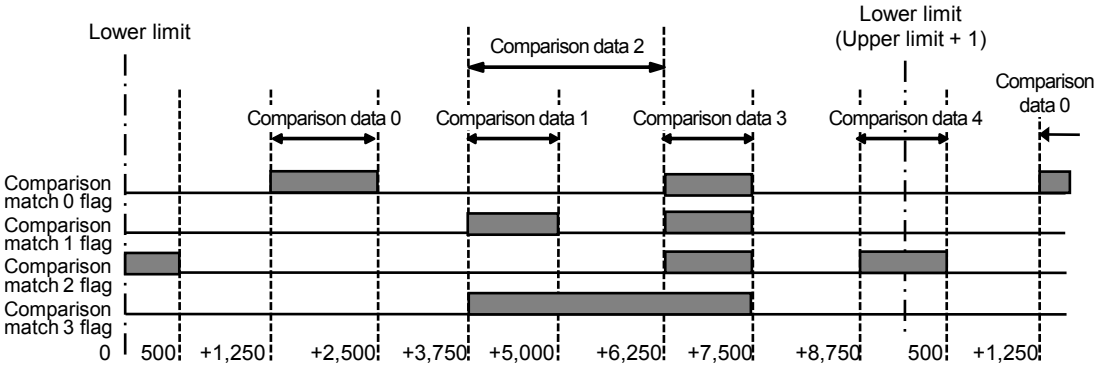
## 7.3.2 Examples of Ring Counter Settings

■ **Operation of band comparison match flag**




■ **Examples of output pattern settings**

| Comparison data | Band comparison value | | Output pattern | Comparison match 0 flag | Comparison match 1 flag | Comparison match 2 flag | Comparison match 3 flag |
|---|---|---|---|---|---|---|---|
| | Lower limit | Upper limit | | | | | |
| 0 | +1,250 | 2,500 | Set pattern | ON | OFF | OFF | OFF |
| 1 | +3,750 | +5,000 | Set pattern | OFF | ON | OFF | ON |
| 2 | +3,750 | +7,500 | Set pattern | OFF | OFF | OFF | ON |
| 3 | +6,250 | +7,500 | Set pattern | ON | ON | ON | ON |
| 4 | +8,750 | +500 | Set pattern | OFF | OFF | ON | OFF |

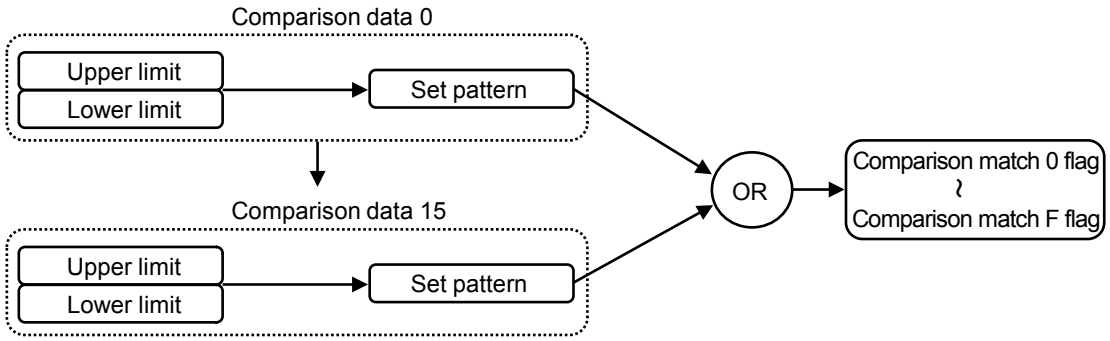
## ◆ KEY POINTS

- **For the ring counter, comparison data is set for the area including the upper and lower limits in which the count value is rolled over, and set patterns can be set.**

## 7.3.3 Configuration of Band Comparison

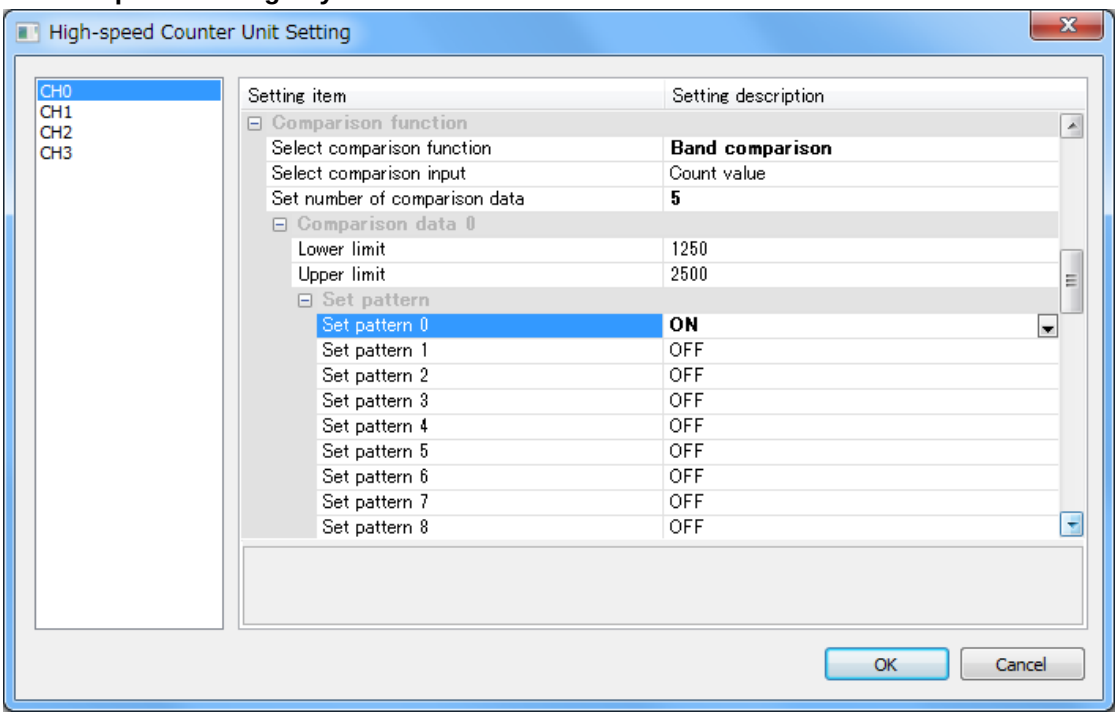
### ■ Overview of setting items

- When the current value exists between the lower and upper limits of each comparison data, the ON or OFF state of each flag is set for each comparison data.
- Multiple comparison match flags can be set for one comparison data.
- Multiple comparison data can be set for the same band.




*Setting for Band comparison*

### ■ Example of settings by FPWIN GR7



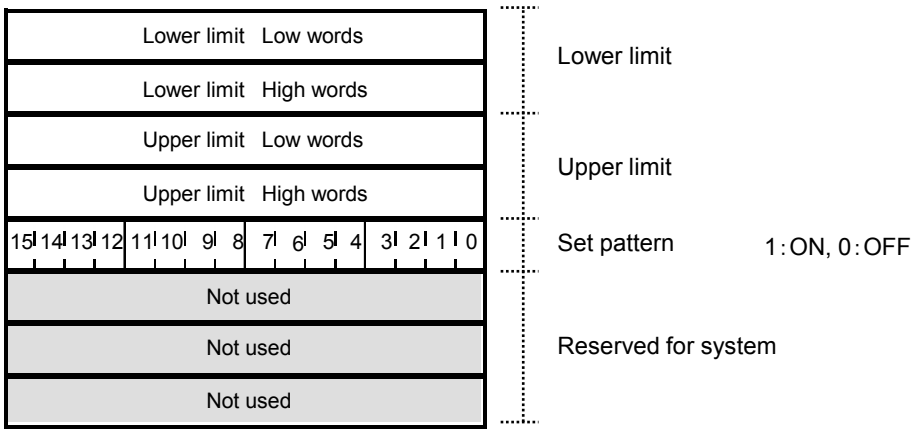
■ **Pattern of storage in unit memories (UM)**

- Set data is stored in 8-word blocks of corresponding unit memories in the following format.
- When using user programs, set data in corresponding unit memory numbers.

Example 1) For the comparison data 0 of CH0, it is allocated to UM00080 to UM00087.

Example 2) For the comparison data 1 of CH0, it is allocated to UM00088 to UM0008F.

- The bit numbers 0 to 15 in the area of +4 in the figure below correspond to the comparison match 0 flag to F flag.


Lower limit Low words
Lower limit High words
Upper limit Low words
Upper limit High words
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
Not used
Not used
Not used
Lower limit
Upper limit
Set pattern
1 : ON, 0 : OFF
Reserved for system

◆ **REFERENCE**

- **For details of unit memory numbers, refer to 11.4 Unit Memory Detailed Specifications.**

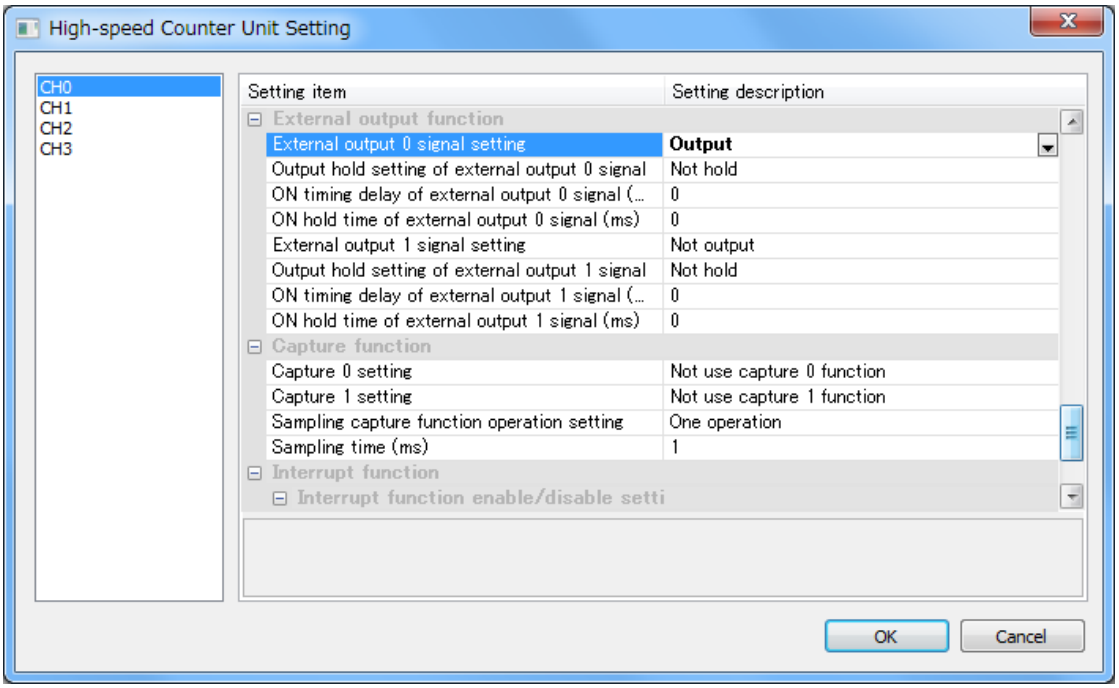
# 7.4 External Output

## 7.4.1 Overview of External Output Function

### ■ External output function

- The result of comparison is reflected in 16 flags (comparison match 0 flag to comparison match F flag), and the two of them (comparison match 0 flag and comparison match 1 flag) can be retrieved as external outputs by being allocated to the external output terminals of the unit.
- The configuration menu of FPWIN GR7 or the corresponding unit memories (UM) are used for the allocation.

### ■ Example of settings by FPWIN GR7



■ **Setting items and corresponding unit memory numbers**

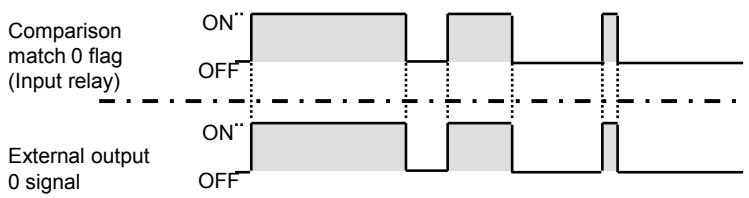
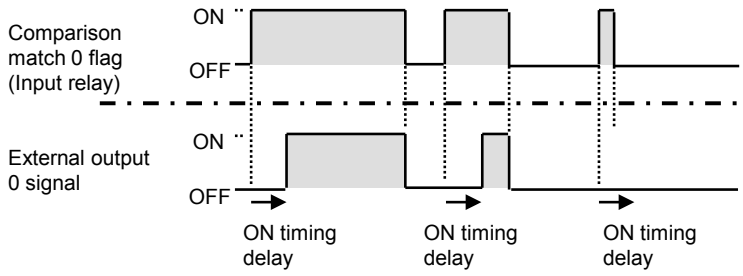
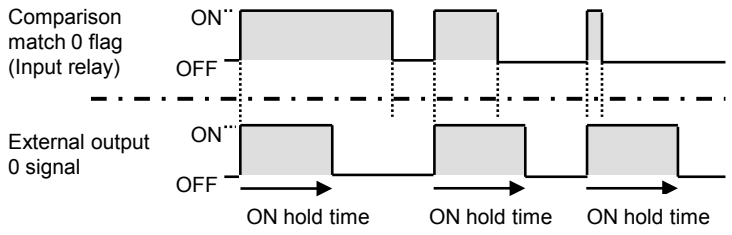
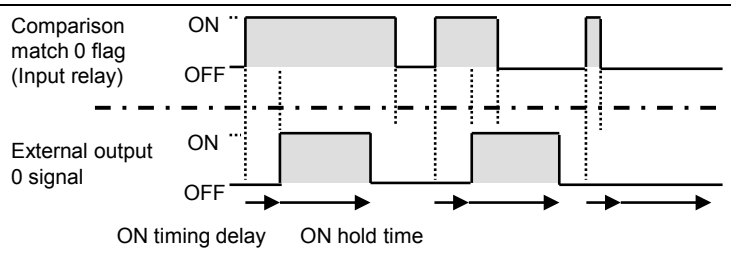
| Unit memory No. (Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00100<br>UM 001D0<br>UM 002A0<br>UM 00370 | External output 0 signal setting | H0 | Set whether or not to output the comparison match 0 flag to the external output 0 signal.<br>H0: Not output<br>H1: Output | — |
| UM 00101<br>UM 001D1<br>UM 002A1<br>UM 00371 | Output hold setting of external output 0 signal | H0 | Set whether or not to hold the output signal in the program mode when an error occurs.<br>H0: Not hold<br>H1: Hold | — |
| UM 00102<br>UM 001D2<br>UM 002A2<br>UM 00372 | External output 0 signal ON timing delay (Available when band comparison function is used) | 0 | Set the ON timing delay of external output 0 signal.<br>Setting range: 0 to 1,000(The values out of the setting range are invalid.) | ms |
| UM 00103<br>UM 001D3<br>UM 002A3<br>UM 00373 | External output 0 signal ON hold time (Available when band comparison function is used) | 0 | Set the ON hold time of external output 0 signal.<br>Setting range: 0 to 1,000 (The values out of the setting range are invalid.) | ms |
| UM 00104<br>UM 001D4<br>UM 002A4<br>UM 00374 | External output 1 signal setting | H0 | Set whether or not to output the comparison match 1 flag to the external output 1 signal.<br>H0: Not output<br>H1: Output | — |
| UM 00105<br>UM 001D5<br>UM 002A5<br>UM 00375 | Output hold setting of external output 1 signal | H0 | Set whether or not to hold the output signal in the program mode when an error occurs.<br>H0: Not hold<br>H1: Hold | — |
| UM 00106<br>UM 001D6<br>UM 002A6<br>UM 00376 | External output 1 signal ON timing delay (Available when band comparison function is used) | 0 | Set the ON timing delay of external output 1 signal.<br>Setting range: 0 to 1,000 (The values out of the setting range are invalid.) | ms |
| UM 00107<br>UM 001D7<br>UM 002A7<br>UM 00377 | External output 1 signal ON hold time (Available when band comparison function is used) | 0 | Set the ON hold time of external output 1 signal.<br>Setting range: 0 to 1,000 (The values out of the setting range are invalid.) | ms |

(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

## 7.4.2 Output Pattern Setting (Only for Band Comparison)

When using the band comparison function, the ON timing delay time or ON hold time can be set for output signals.

■ **Operational difference between settings**

| ON hold time | ON timing delay | Timing chart of comparison match flag and external output |
|---|---|---|
| 0 | 0 |  |
| 0 | 1 to 1,000 ms |  |
| 1 to 1,000 ms | 0 |  |
| 1 to 1,000 ms | 1 to 1,000 ms |  |

### 7.4.3 Forced Output Function

- The outputs of external output 0 terminal and external output 1 terminal can be controlled on the ladder monitor or device monitor of tool software FPWIN GR7. They can be also turned on or off by user programs.
- It can be used for the confirmation of wirings.

■ **I/O Allocation of external output terminals**

| Signal name | Effective condition | CH0 | CH1 | CH2 | CH3 |
|---|---|---|---|---|---|
| External output 0 forced ON | Level | Y109 | Y119 | Y129 | Y139 |
| External output 0 forced OFF | Level | Y10A | Y11A | Y12A | Y13A |
| External output 1 forced ON | Level | Y10B | Y11B | Y12B | Y13B |
| External output 1 forced OFF | Level | Y10C | Y11C | Y12C | Y13C |

(Note 1): The above I/O numbers are those for the slot number 1 and the starting word number 10. The I/O numbers actually used vary according to the slot number where the unit is installed and the starting word number.

◆ **KEY POINTS**

- **The above forced output function is a function of the high-speed counter unit. The forced I/O function of programming tool FPWIN GR7 is not used.**

# 8

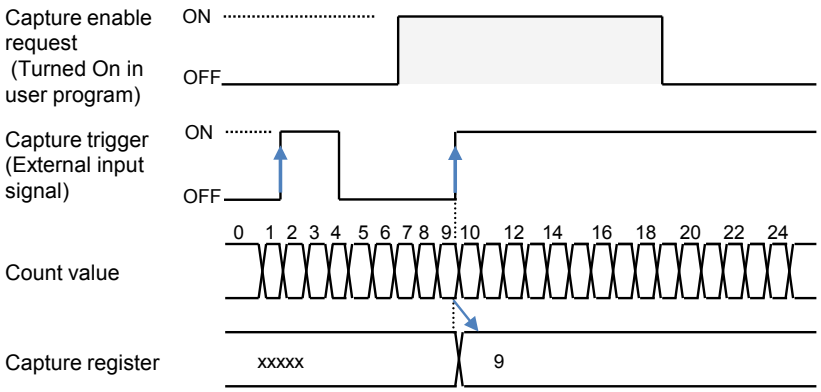
# Capture Function

# 8.1 Overview of Functions

## 8.1.1 Types of Capture Function

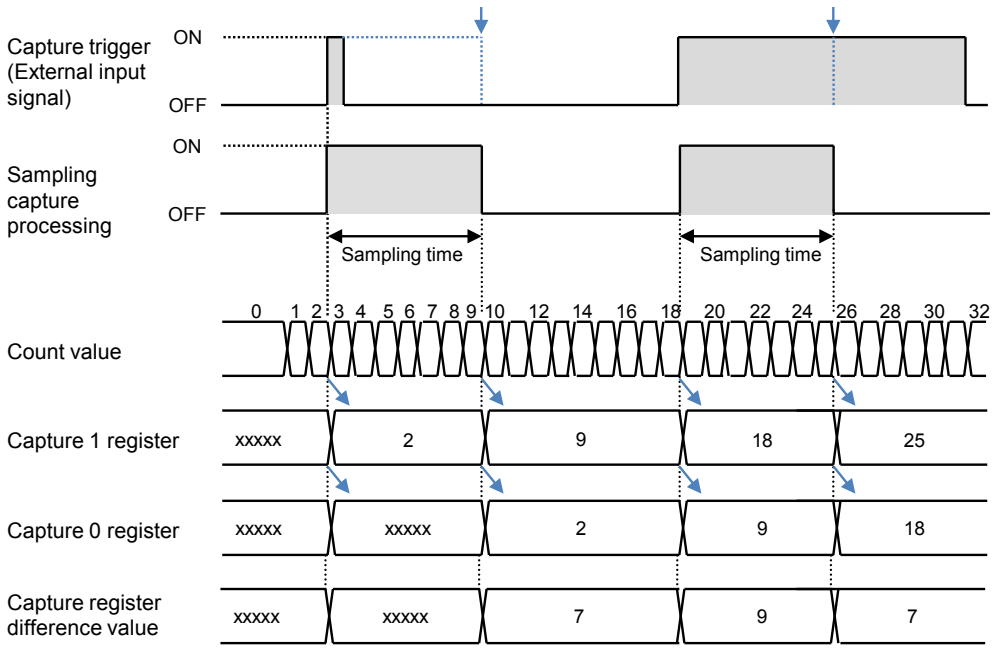
### ■ Capture function

- Stores the count value at the time an external input signal changes into the unit memory (capture register) of the high-speed counter unit.




### ■ Sampling capture function

- Stores the count values during a specified sampling time form the time an external input signal changes into the unit memory (capture register) of the high-speed counter unit.
- The count values for the sampling time can be monitored by reading the difference value register.


Capture trigger (External input signal)
ON
OFF
Sampling capture processing
ON
OFF
Sampling time
Sampling time
0 1 2 3 4 5 6 7 8 9 10 12 14 16 18 20 22 24 26 28 30 32
Count value
Capture 1 register
xxxxx 2 9 18 25
Capture 0 register
xxxxx xxxxx 2 9 18
Capture register difference value
xxxxx xxxxx 7 9 7

## 8.1.2 Restrictions on Combinations

Available conditions vary by functions.

■ **Comparison of functions**

<table>
<tr><th colspan="2">Item</th><th>Capture function</th><th>Sampling capture function</th></tr>
<tr><td colspan="2" rowspan="2">Usable number of points</td><td>Max. 2 points</td><td>Max. 1 point</td></tr>
<tr><td colspan="2">The capture function cannot be used when using the sampling capture function.</td></tr>
<tr><td colspan="2" rowspan="2">Used unit memory (UM) area (Note 1)</td><td>Individually usable;<br>Capture 0 register: 1 point (2 words)<br>Capture 1 register: 1 point (2 words)</td><td>Use Capture 0 register: 1 point (2 words)</td></tr>
<tr><td colspan="2">Difference value register (Value of Capture 1 register - Value of Capture 0 register): 1 point (2 words)</td></tr>
<tr><td colspan="2">Buffer function (Note 2)</td><td colspan="2">Data in the capture registers are shifted to the buffer area in sequence when executing the capture function.<br>For the capture 0 register, capture 1 register, difference value register (when activating the capture 0) and difference value register (when activating the capture 1), each 60-point (120-word) area is secured.</td></tr>
<tr><td colspan="2">Capture function valid condition (Note 2)</td><td>The capture function is valid while the capture enable request signals (Y7, Y17, Y27, Y37) is on using user programs.</td><td>The capture function is always valid.</td></tr>
<tr><td rowspan="4">Capture trigger (Note 1)</td><td colspan="2">Allocated in the configuration menu of tool software.</td><td></td></tr>
<tr><td>Control signal 0</td><td>Used as a trigger for capture 0 or capture 1.</td><td>Used as a tirgger for both capure 0 and capture 1.</td></tr>
<tr><td>Control signal 1</td><td>Used as a trigger for capture 0 or capture 1.</td><td>Not used</td></tr>
<tr><td>Capture trigger signal valid condition</td><td>Activated when any of the following conditions is met.<br>● Leading edge of control signal<br>● Trailing edge of control signal<br>It is possible to allocate one control signal to different capture numbers as the signals of leading edge and trailing edge respectively.</td><td>Activated when any of the following conditions is met.<br>● Control signal (Positive logic)<br>● Control signal (Negative logic)<br>● Capture enable request by user programs (Y7, Y17, Y27, Y37)</td></tr>
<tr><td colspan="2">Capture data memory area clear (Note 3)</td><td colspan="2">Capture 0 register and capture 1 register can be cleared individually using user programs.<br>Buffer areas can be reset at the same time.</td></tr>
<tr><td colspan="2">Capture done flag clear (Note 3)</td><td colspan="2">It is automatically cleared at the time of I/O refresh.<br>Capture 0 register and capture 1 register can be cleared individually using user programs.</td></tr>
</table>

(Note 1) Functions and capture trigger signals to be used are set in the configuration menu of tool software or user programs.

(Note 2) The buffer function and capture function valid conditions are available from thei high-speed counter unit Ver.1.2.

(Note 3) The capture value clear request and capture done flag clear request signals are available from the high-speed counter unit Ver.1.2. They can be set in user programs.

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### 8.1.3 Configuration

- For using the capture function or sampling capture function, set the following items using the configuration menu of tool software or user programs.
- Set the signal allocated to the trigger signal for executing capturing and the number of operations. For the sampling capture, also set the sampling time.

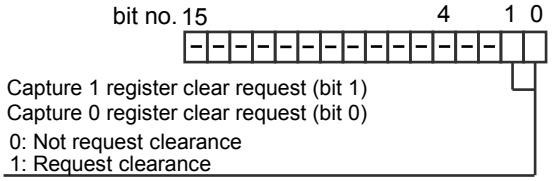
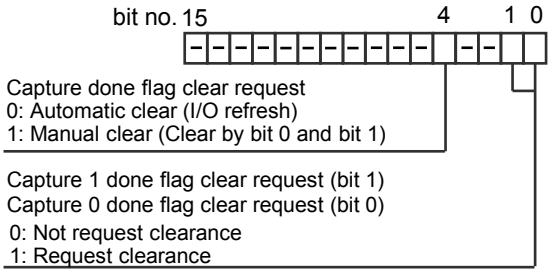
■ **Setting area**

| Unit memory No. (Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00110<br>UM 001E0<br>UM 002B0<br>UM 00380 | Capture 0 setting | H0 | Make the setting for the capture function or sampling capture function.<br>H0: Not use capture 0 function<br>H1: Capture function at rising edge of control 0 signal<br>H2: Capture function at trailing edge of control 0 signal<br>H3: Capture function at rising edge of control 1 signal<br>H4: Capture function at trailing edge of control 1 signal<br>H5: Control 0 signal positive logic sampling capture function<br>H6: Control 0 signal negative logic sampling capture function<br>H7: Control 1 signal positive logic sampling capture function<br>H8: Control 1 signal negative logic sampling capture function<br>H9: Output relay (Y relay) sampling capture function | - |
| UM 00111<br>UM 001E1<br>UM 002B1<br>UM 00381 | Capture 1 setting | H0 | Make the setting for the capture function or sampling capture function.<br>H0: Not use capture 1 function<br>H1: Capture function at rising edge of control 0 signal<br>H2: Capture function at trailing edge of control 0 signal<br>H3: Capture function at rising edge of control 1 signal<br>H4: Capture function at trailing edge of control 1 signal<br>However, this setting area is invalid when the sampling capture function (H5 to H9) is selected in the capture 0 setting. | - |
| UM 00112<br>UM 001E2<br>UM 002B2<br>UM 00382 | Capture function operation setting | H0 | Make the setting for the capture function or sampling capture function.<br>H0: One operation<br>H1: Continuous operation | - |
| UM 00113<br>UM 001E3<br>UM 002B3<br>UM 00383 | Sampling time | 1 | Set the sampling time for using the sampling capture function.<br>Setting range: 1 to 65,535 (The values out of the setting range are invalid.) | ms |

(Note 1) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

☛ next page

■ **Setting area**

| Unit memory No. (Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00114<br>UM 001E4<br>UM 002B4<br>UM 00384 | Capture value clear request | H0 | ● Clears values stored in the capture registers and capture register buffers.<br>● To clear the capture 0 register, turn off, on and off the bit 0 of the unit memory. To clear the capture 1 register, turn off, on and off the bit 1 of the unit memory.<br>● Clears the areas of capture 0 register, capture 0 register buffer and register difference value buffer when requesting the capture 0 by executing the clearance of the capture 0 register.<br>● Clears the areas of capture 1 register, capture 1 register buffer and register difference value buffer when requesting the capture 1 by executing the clearance of the capture 1 register.<br>  | - |
| UM 00115<br>UM 001E5<br>UM 002B5<br>UM 00385 | Capture done flag clear request (Edge type) | H0 | ● The capture done flag is automatically reset at the time of I/O refresh at the default setting.<br>● It is used to reset the capture 0 done flag and capture 1 done flag using user programs.<br>● To reset the capture 0 done flag, write H11 and then H10. To reset the capture 1 done flag, write H12 and then H10.<br>  | - |

(Note 1) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

(Note 2) The capture value clear request and capture done flag clear request signals are available from the high-speed counter unit Ver.1.2. They can be set in user programs.

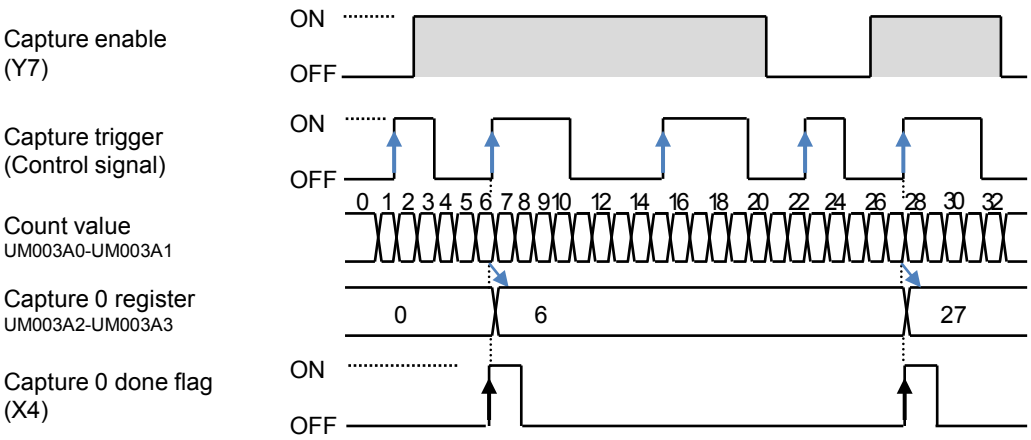
(Note 3) Even if the capture value clear request is executed, the number of completed capture operations in the buffer area will not be cleared. The number of completed capture operations will be cleared when the capture enable request (Y7) or the sampling capture function is activated.

## 8.2 Operations of Capture Function

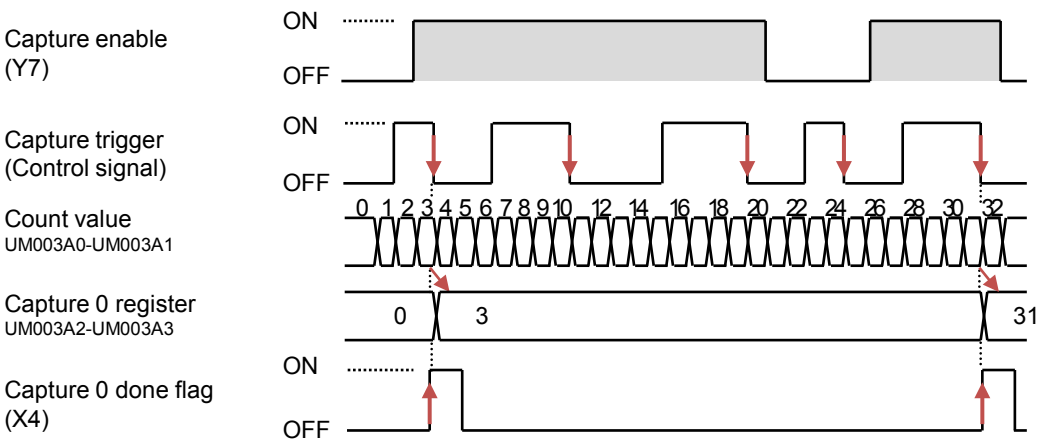
### 8.2.1 One operation

- Capturing is executed when the first capture trigger condition (control signal) is met while the capture function is enabled by the capture enable request signal (Y7).
- The operation changes as follows according to the settings (leading and trailing edges) of the valid control signal.

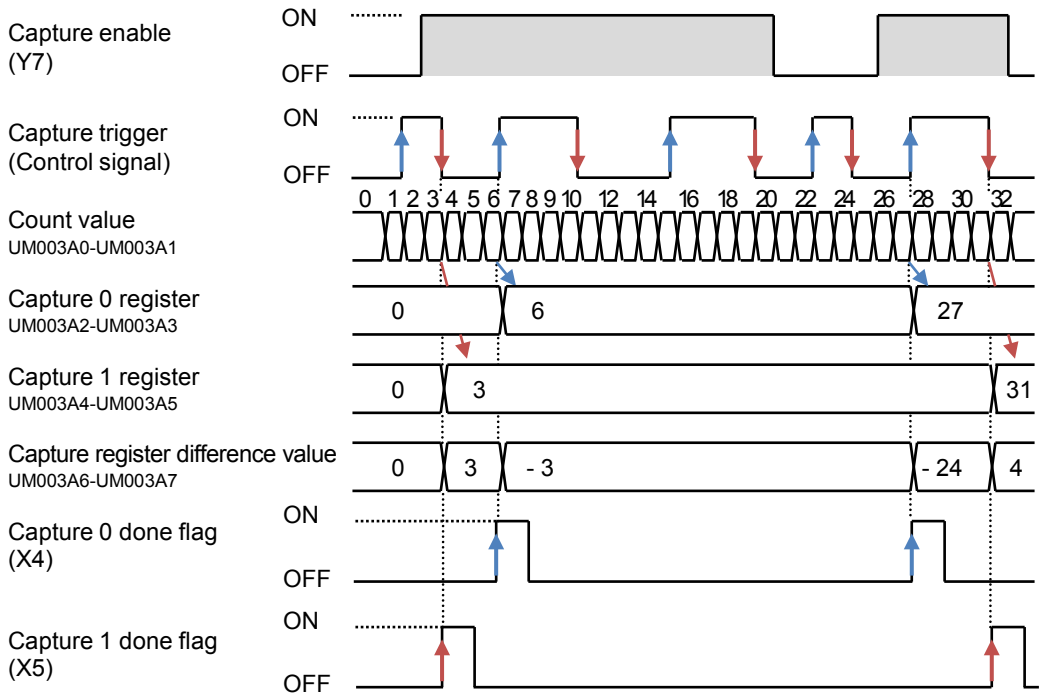
■ **When "Leading edge" is set as the capture trigger condition**




■ **When "Trailing edge" is set as the capture trigger condition**



■ **When "Leading edge" and "Trailing edge" of the same signal are set as the capture trigger condition**



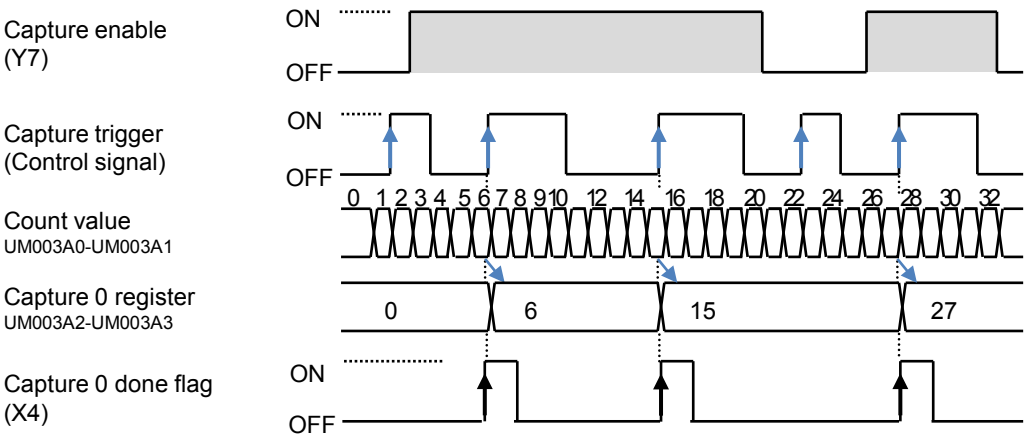

◆ **KEY POINTS**

- **The values ((Capture 1 register) - (Capture 0 register)) are always stored as capture register difference values. The signs for the values of capture difference value register change according to the sequence of the capture enable signal (output Y contact) and the capture trigger (control signal).**

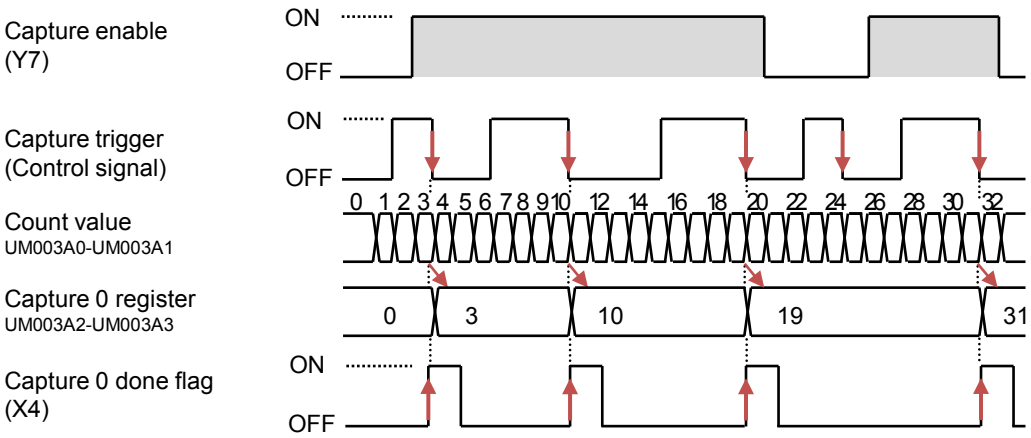
## 8.2.2 Continuous Operation

- Capturing is executed every time the capture trigger condition (control signal) is met while the capture function is enabled by the capture enable request signal (Y7).
- The operation changes as follows according to the settings (leading and trailing edges) of the valid control signal.

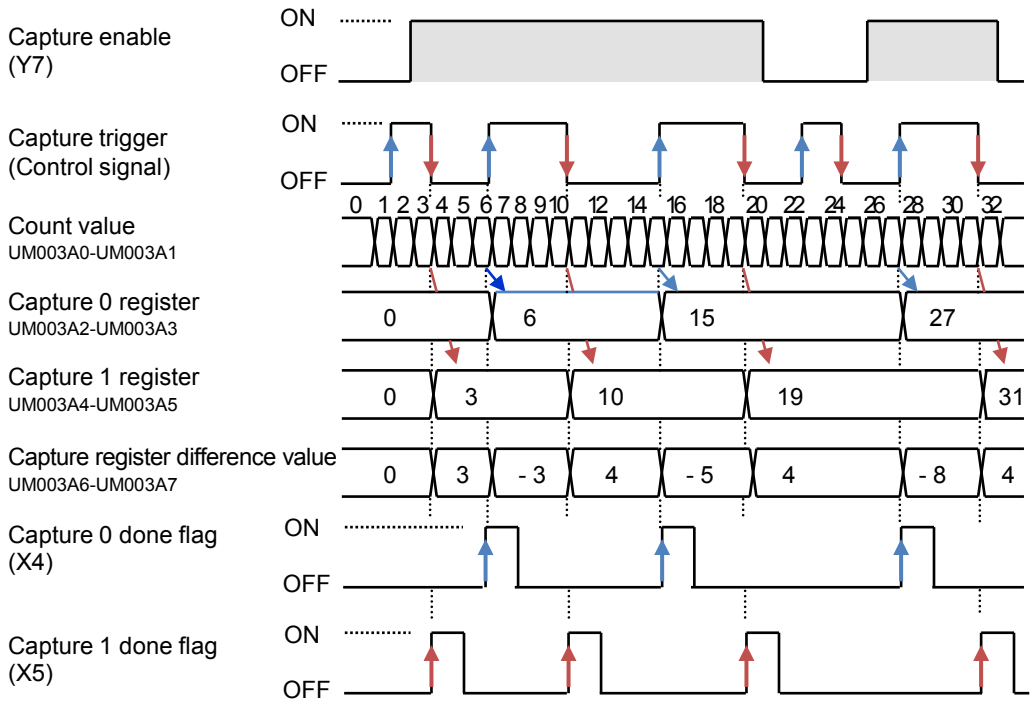
■ **When "Leading edge" is set as the capture trigger condition**




■ **When "Trailing edge" is set as the capture trigger condition**



■ **When "Leading edge" and "Trailing edge" of the same signal are set as the capture trigger condition**




◆ **KEY POINTS**

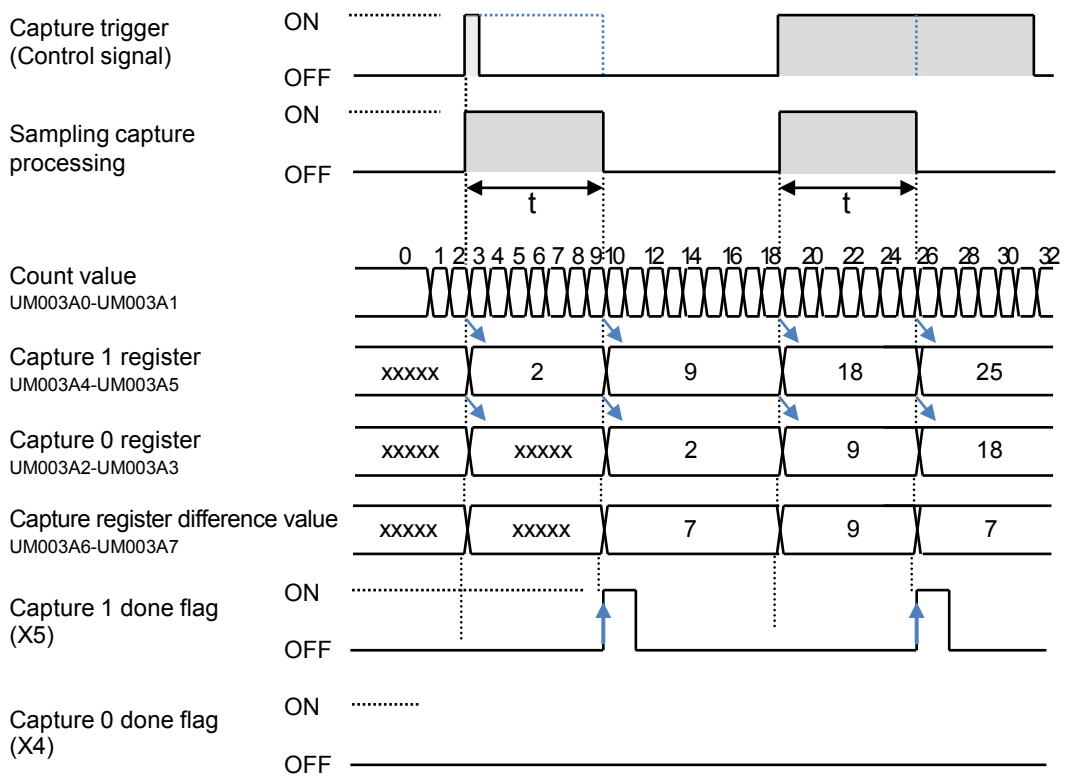
- **The values ((Capture 1 register) - (Capture 0 register)) are always stored as capture register difference values. The signs for the values of capture difference value register change according to the sequence of the capture enable signal (output Y contact) and the capture trigger (control signal).**
- **In the case of continuous operation, the capture 0 register, capture 1 register and capture difference value register are overwritten every time the capture operation is complete. The buffer function can be also used for reading continuous data.**

# 8.3 Operations of Sampling Capture Function

## 8.3.1 One operation

- The count values and the difference values are stored in the capture registers (unit memories UM) after a specified sampling time from the time that the control signal is turned on or off.
- The sampling capture function is always enabled when the control signal is allocated to the sampling capture function in the configuration.
- The control signal (positive logic), control signal (negative logic) or output relays (Y7, Y17, Y27, Y37) can be selected as the trigger condition to start the sampling capture.

■ **Time chart**



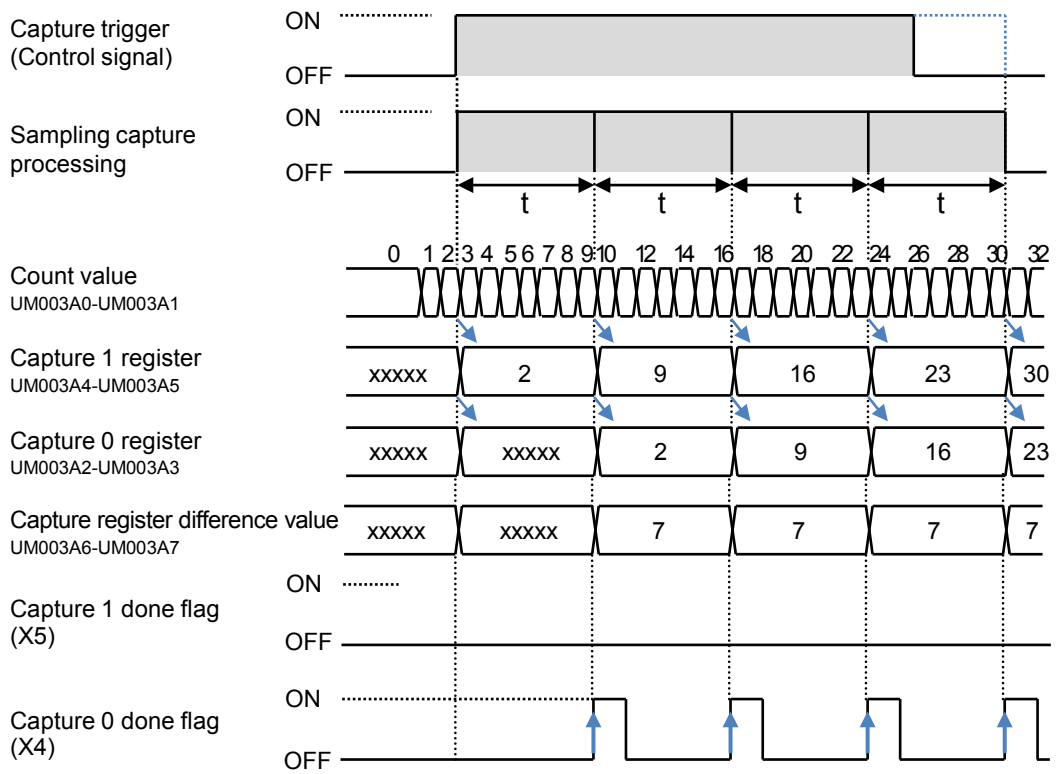

◆ **KEY POINTS**

- **In the sampling capture operation (one operation), the capture 1 done flag is activated. Note that the capture 0 done flag is not activated.**

## 8.3.2 Continuous Operation

- The count values and the difference values are stored in the capture registers (unit memories UM) continuously at intervals of a specified sampling time after the control signal is turned on or off.
- The sampling capture function is always enabled when the control signal is allocated to the sampling capture function in the configuration.
- The control signal (positive logic), control signal (negative logic) or output relays (Y7, Y17, Y27, Y37) can be selected as the trigger condition to start the sampling capture.

■ **Time chart**




◆ **KEY POINTS**

- **In the sampling capture operation (continuous operation), the capture 0 done flag is activated. Note that the capture 1 done flag is not activated.**

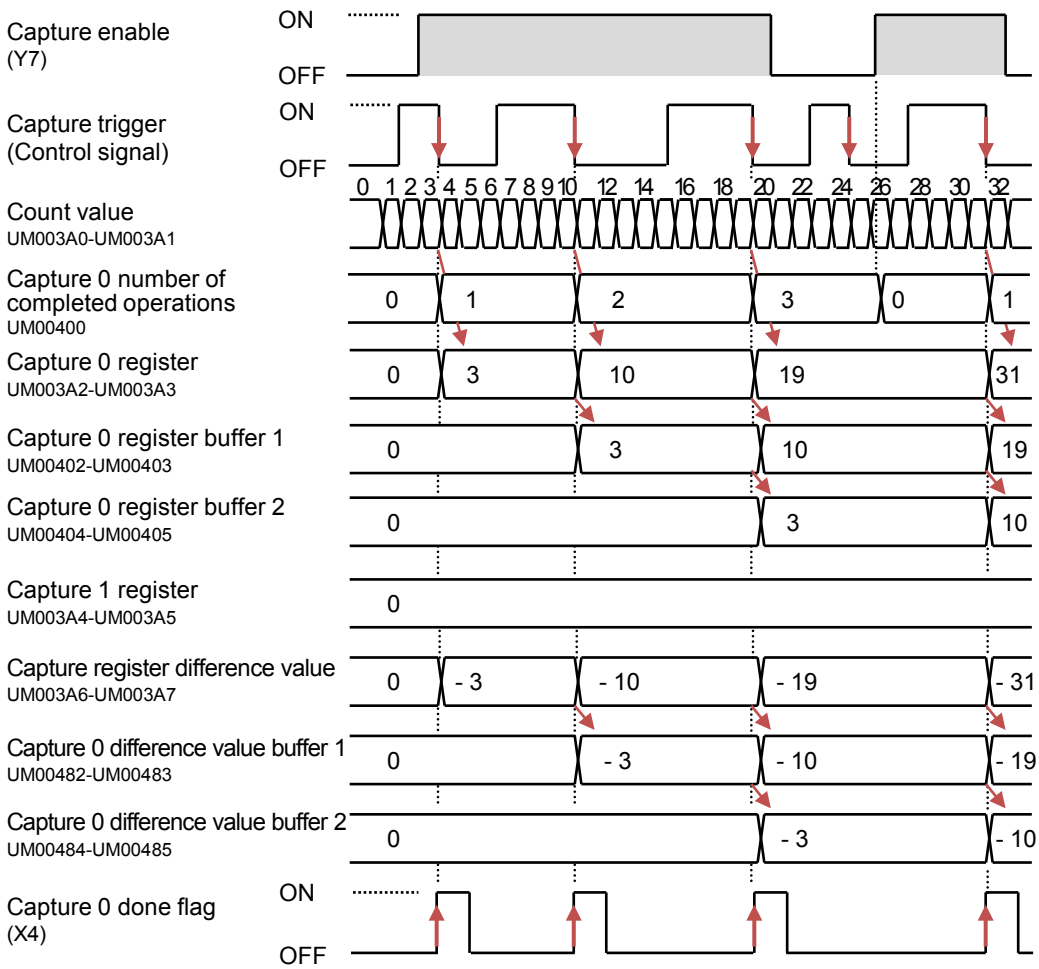
# 8.4 Operations of Buffer Function

## 8.4.1 Overview of Buffer Function

### ■ Function of buffer areas

- In the buffer areas, 60-point (120-word) areas are each provided for the capture 0, capture 1 and difference values each.
- Latest captured data is stored in the capture 0 register or capture 1 register.
- Every time the data in the capture register is updated, the data in the capture register is shifted and stored in the buffer areas 1 to 60 sequentially. The data stored in the buffer 60 (the oldest data) is discarded.

### ■ Time chart



## ■ Types of buffer areas

| Name | Default | Setting range and description | Unit |
|---|---|---|---|
| Number of completed capture operations | 0 | Monitors the number of completed capture operations while capturing is enabled. It is reset to zero when the capture request turns on. | - |
| Capture register buffer (Buffer 1 to Buffer 60) | 0 | Every time the data in the capture register are updated, the data in the capture register are shifted and stored in sequence.<br>Range:-2,147,483,648 to 2,147,483,647<br>Signed 32-bit | Pulse |
| Capture register difference value buffer (Buffer 1 to Buffer 60) | 0 | Every time the data in the capture register are updated, the data of capture register difference values (Capture 1 register - Capture 0 register) are shifted and stored in sequence. There are two areas, which are for storing data at the time of capture 0 request and the time of capture 1 request.<br>Range: -2,147,483,648 to 2,147,483,647<br>Signed 32-bit | Pulse |

## ■ Related unit memory (UM) No.

| Monitoring item | | Unit memory (UM) No. | | | |
|---|---|---|---|---|---|
| | | CH0 | CH1 | CH2 | CH3 |
| Capture value buffer area | Number of completed capture 0 operations | UM00400 | UM00600 | UM00800 | UM00A00 |
| | Capture 0 register (Buffer 1 to Buffer 60) | UM00402 - UM00479 | UM00602 - UM00679 | UM00802 - UM00879 | UM00A02 - UM00A79 |
| | Register difference value for capture 0 request (Buffer 1 to Buffer 60) | UM00482 - UM004F9 | UM00682 - UM006F9 | UM00882 - UM008F9 | UM00A82 - UM00AF9 |
| | Number of completed capture 1 operations | UM00500 | UM00700 | UM00900 | UM00B00 |
| | Capture 1 register (Buffer 1 to Buffer 60) | UM00502 - UM00579 | UM00702 - UM00779 | UM00902 - UM00979 | UM00B02 - UM00B79 |
| | Register difference value for capture 1 request (Buffer 1 to Buffer 60) | UM00582 - UM005F9 | UM00782 - UM007F9 | UM00982 - UM009F9 | UM00B82 - UM00BF9 |

(Note 1) For information on the memory numbers actually used, refer to each items of "11.4 Unit Memory Detailed Specifications". The above list includes empty areas which are reserved in the system. Do not read empty areas or write into empty areas.

# 8.5 Reading Capture Data

## 8.5.1 Reading Capture Register Data

■ **Area in which capture data is stored**

- Latest captured data is stored in the capture 0 register or capture 1 register of unit memory(UM).
- The values ((Capture 1 register) - (Capture 0 register)) are stored in the capture register difference value area.
- They are stored as signed 32-bit data (-2,147,483,648 to 2,147,483,647).

■ **Related unit memory (UM) No.**

| Monitor item | | Unit memory (UM) No. | | | |
|---|---|---|---|---|---|
| | | CH0 | CH1 | CH2 | CH3 |
| Monitor area | Capture 0 register | UM003A2-UM003A3 | UM003B2-UM003B3 | UM003C2-UM003C3 | UM003D2-UM003D3 |
| | Capture 1 register | UM003A4-UM003A5 | UM003B4-UM003B5 | UM003C4-UM003C5 | UM003D4-UM003D5 |
| | Capture register difference value | UM003A6-UM003A7 | UM003B6-UM003B7 | UM003C6-UM003C7 | UM003D6-UM003D7 |

■ **I/O allocation**

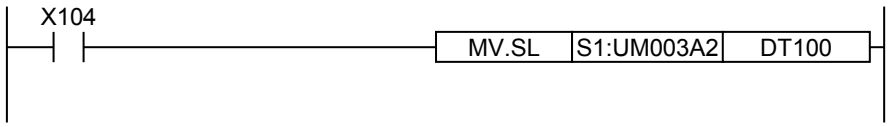
| Signal name | CH0 | CH1 | CH2 | CH3 |
|---|---|---|---|---|
| Capture 0 done flag | X104 | X124 | X144 | X164 |
| Capture 1 done flag | X105 | X125 | X145 | X165 |

(Note 1): The above I/O numbers are those for the slot number 1 and the starting word number 10. The I/O numbers actually used vary according to the slot number where the unit is installed and the starting word number.

■ **Sample program**

Data is read out to arbitrary operation memories using the done flag which indicates the completion of capture.

Example) Program to read the capture value of CH0 of the high-speed counter unit installed in the slot number 1

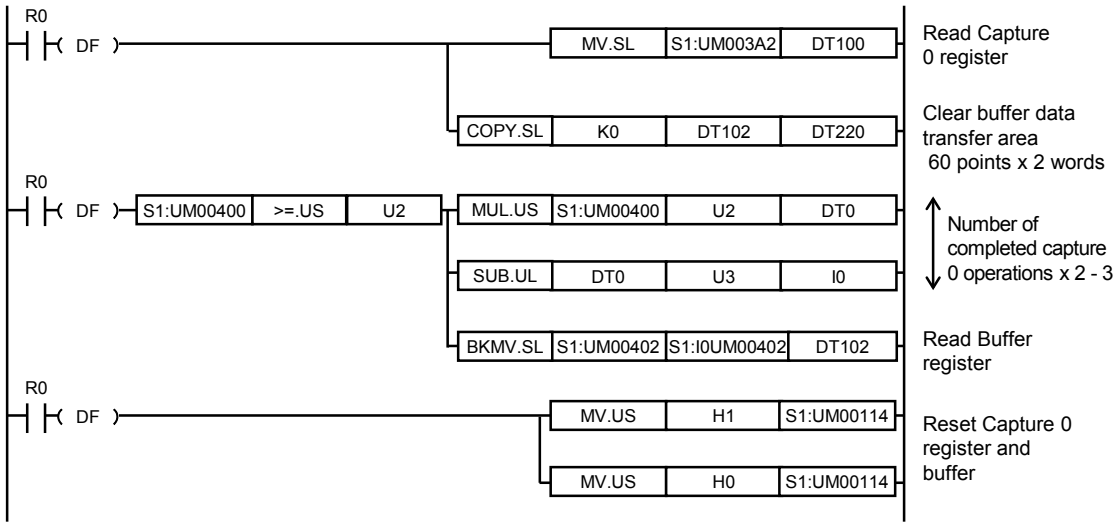


## 8.5.2 Reading Buffer Area Data

To read data in the buffer area, check the number of completed capture operations (UM00400), and specify the range of the operation memory according to the number.

■ **Sample program**

Example) Program to read the capture value and buffer value of CH0 of the high-speed counter unit installed in the slot number 1



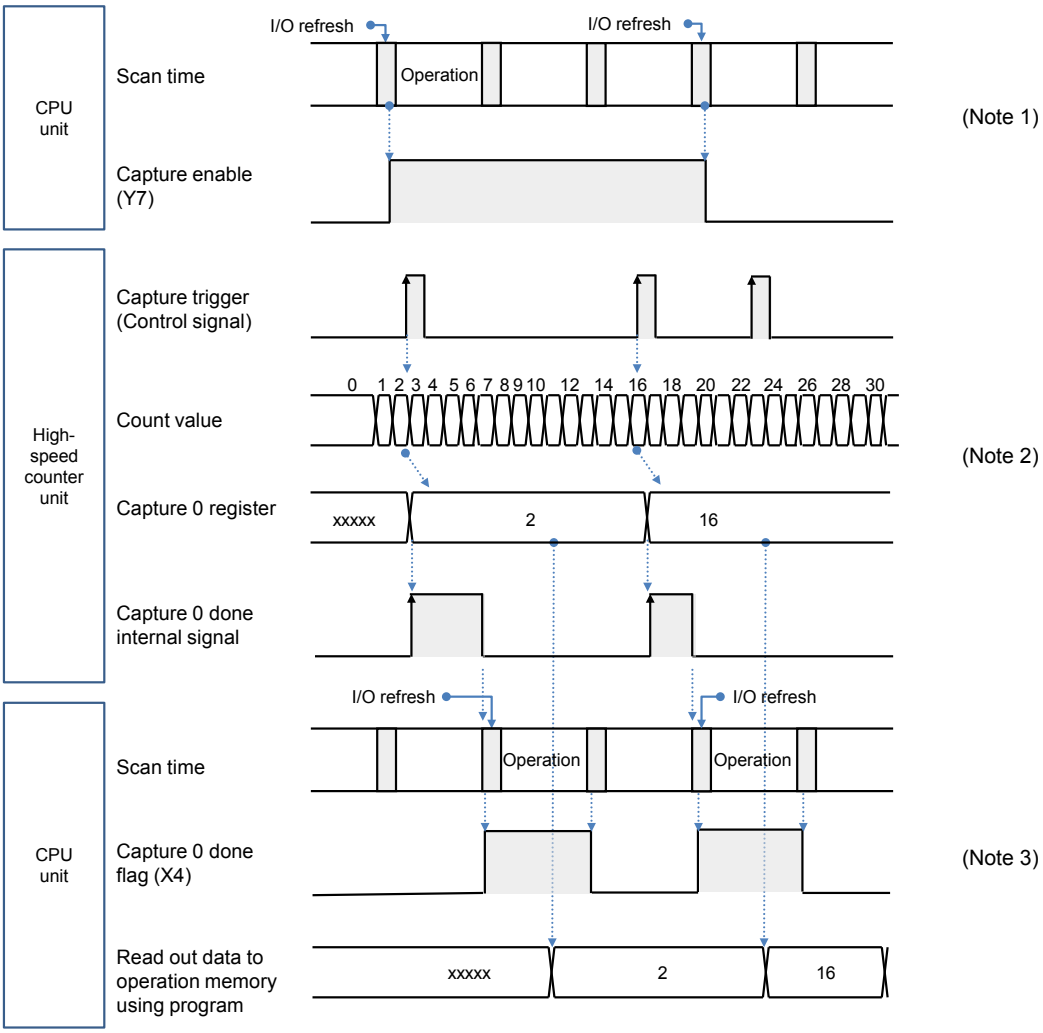

◆ **REFERENCE**

- **For information on the clear of capture registers and buffers, refer to 8.6 Clearing Capture Values Storage Area.**
- **For details of unit memory (UM) numbers, refer to 11.4 Unit Memory Detailed Specifications.**

## 8.5.3 Operation and Readout of Capture Done Flag (X4/X5)

### ■ Basic operation

- On the completion of capturing, the capture done flag is reflected in the operation memory of the CPU (X4/X5) at the time of I/O refresh.
- In case of the capture function, the capture done flag is reset by executing the capture enable request signal (Y7).




(Note 1) Turn on the capture enable signal using the user program.

(Note 2) The high-speed counter unit performs the capture operation without synchronizing with the operation of the CPU unit every time control signals turn on as the capture trigger. The capture done internal signal used for the system in the high-speed counter unit is reset at the time of I/O refresh of the CPU unit.

(Note 3) The capture done flag of the CPU unit is reflected in the operation memory (X4/X5) at the time of I/O refresh. It is read to an arbitrary operation memory with the user program using the capture done flag. It is read at the timing of an appropriate operation processing.

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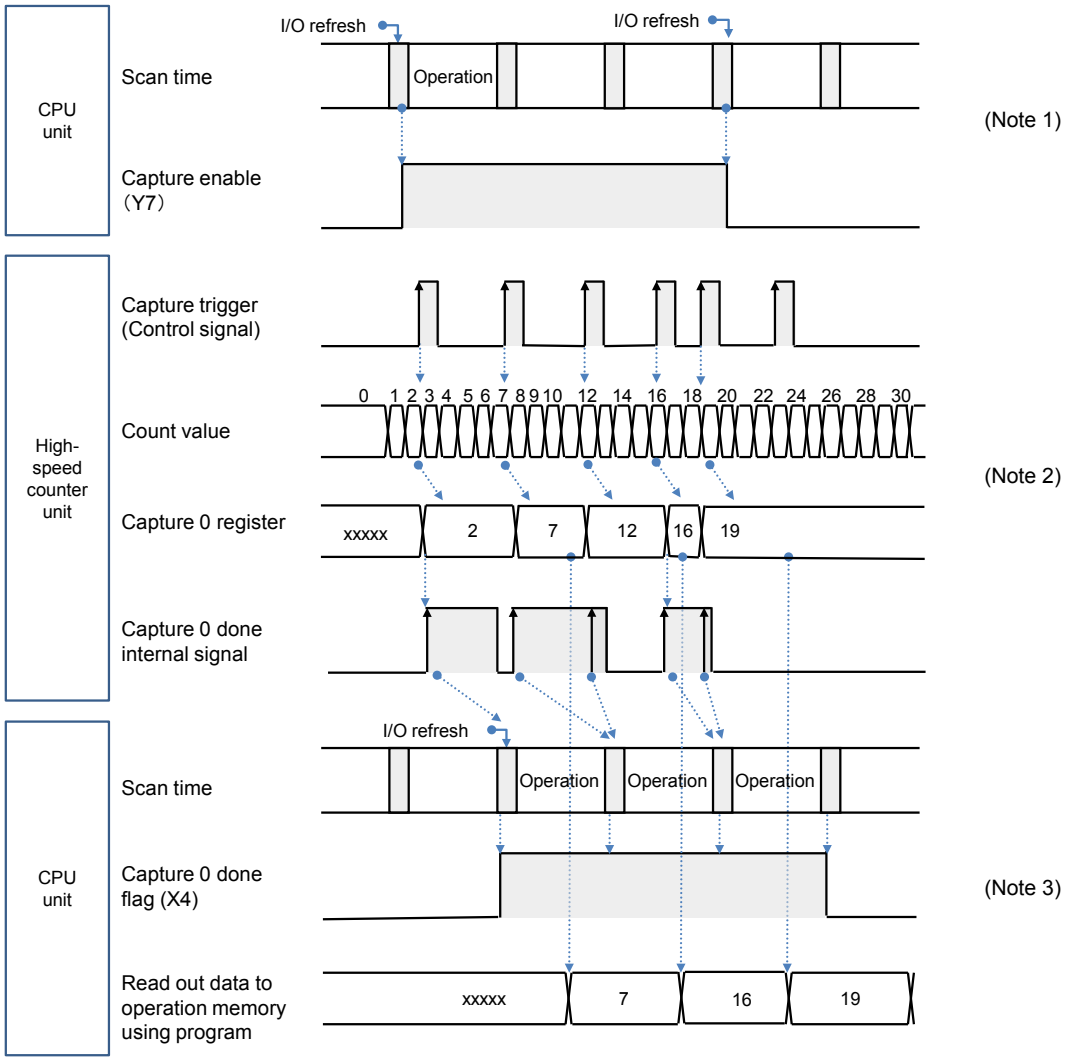
## ■ Processing when capture trigger inputs are used frequently




(Note 1) Turn on the capture enable signal using the user program.

(Note 2) The high-speed counter unit performs the capture operation without synchronizing with the operation of the CPU unit every time control signals turn on as the capture trigger. The capture done internal signal used for the system in the high-speed counter unit is reset at the time of I/O refresh of the CPU unit.

(Note 3) The capture done flag of the CPU unit is reflected in the operation memory (X4/X5) at the time of I/O refresh. When multiple capture operations are performed continuously on the high-speed counter unit, the capture done flag (X4/X5) stays ON.

### ◆ KEY POINTS

- **Whe control signals as capture triggers are input frequently, the capture done flag (X4/X5) stays ON. Note that when reading multiple capture data executed in the high-speed counter unit.**

## 8.5.4 Reference Information (Manual Reset of Capture Done Flag)

### ■ Manual reset of capture done flag

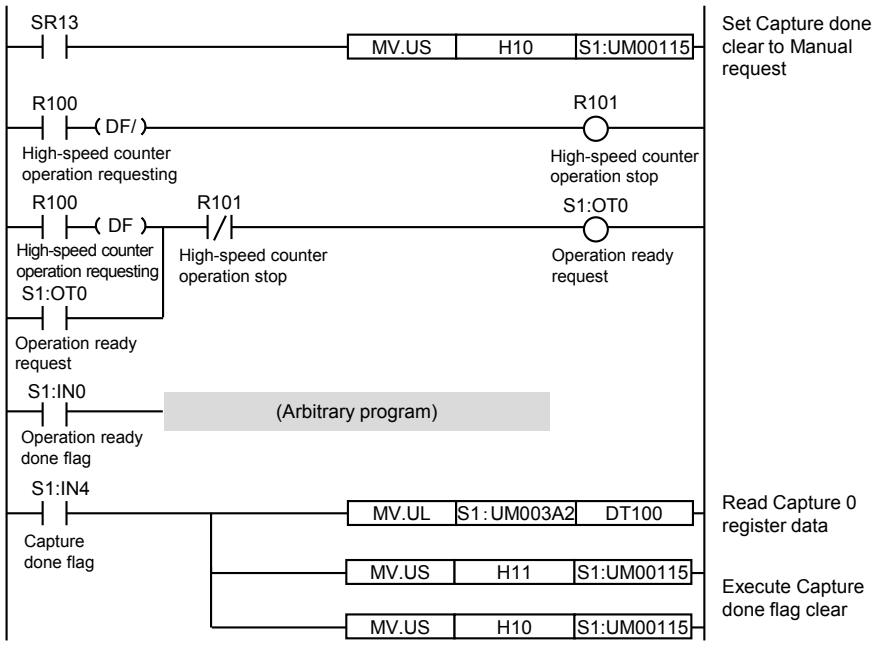
- The capture done flag can also be reset by turning off, on and off the corresponding bit in the capture done flag clear request area.
- The capture 0 done flag and capture 1 done flag can be reset individually.

### ■ Purpose for manual reset of capture done flag

- For the capture done flag, the operation device direct input (IN) and direct output (OT) are used in combination for confirming if capture operations are completed when performing multiple capture operations in one scan time. When the intervals between capture operations are relatively long compared to the scan time, it is not necessary to use them.

### ■ Sample program

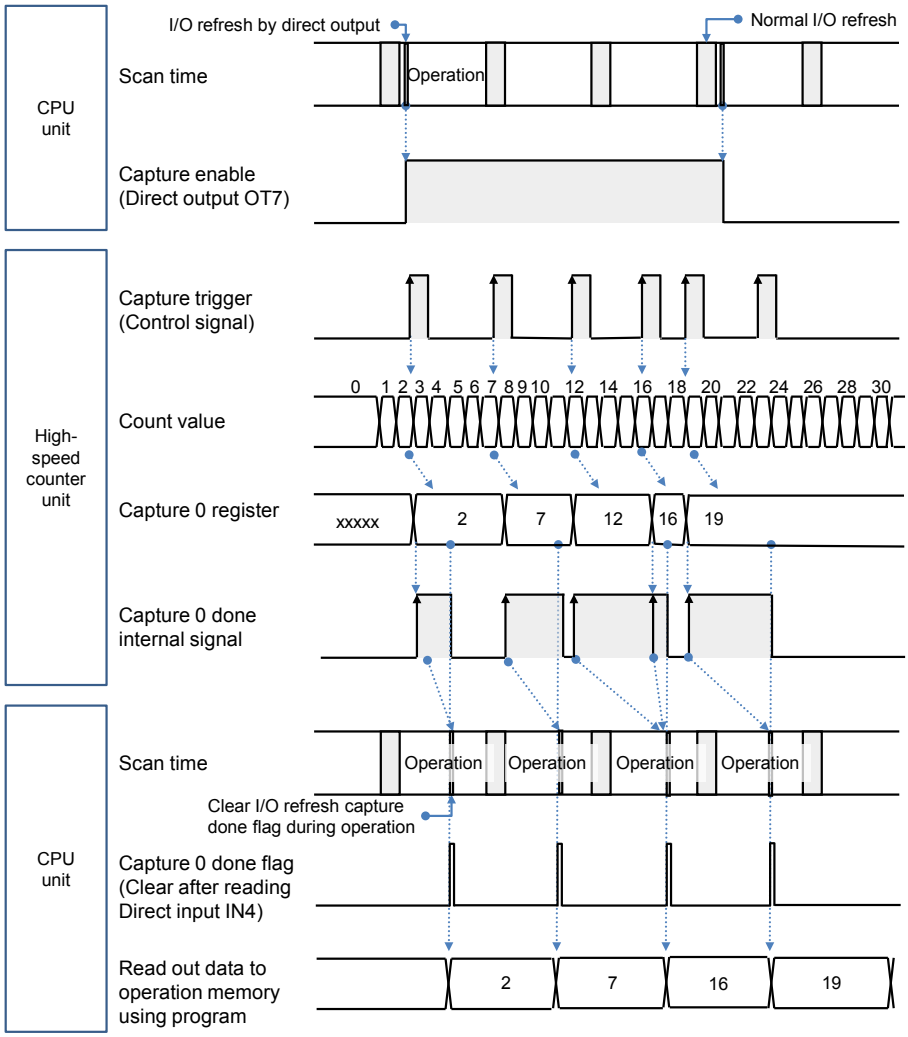
Example) Program to read the capture 0 register of CH0 of the high-speed counter unit installed in the slot No.1 and reset the capture done flag manually




### ◆ KEY POINTS

- **When using operation devices "Direct input IN" and "Direct output OT", I/O refresh processing is performed during arithmetic processing. For using this operation device, check the box of "Exclude this unit from the scope of I/O refresh" in the I/O map of the FP7 configuration dialog box not to perform the normal I/O refresh process executed in a scan time.**

## ■ Processing when resetting the capture done flag manually




(Note 1) Turn on the capture enable signal (OT7) using the user program.

(Note 2) The high-speed counter unit performs the capture operation without synchronizing with the operation of the CPU unit every time control signals turn on as the capture trigger. The capture done internal signal used for the system in the high-speed counter unit is reset by the capture done flag clear request.

(Note 3) When reading the capture done flag in the CPU unit with the operation device (IN4/IN5), I/O refresh is performed when executing operation. Also, it is read when corresponding operation processings are performed on user programs. It is read out to arbitrary operation memories.

# 8.6 Clearing Capture Values Storage Area

## 8.6.1 Capture Value Clear Request

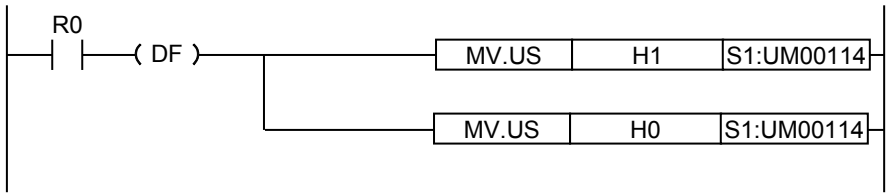
■ **Clearing capture data**

- Capture data can be reset by turning off, on, and off the corresponding bit in the capture value clear request area.
- The capture 0 register and capture 1 register can be reset individually.
- Data stored in the areas of capture registers and capture register buffers is reset to 0 when executing the clear request.

## 8.6.2 Sample Program

■ **Reset program**

Example) Program to reset the capture 0 register of CH0 of the high-speed counter unit installed in the slot No. 1




◆ **KEY POINTS**

- **Even if the capture value clear request is executed, the number of completed capture operations in the buffer area will not be cleared. The number of completed capture operations will be cleared when the capture enable request (Y7) or the sampling capture function is activated.**

◆ **REFERENCE**

For details of unit memory (UM) numbers, refer to 11.4 Unit Memory Detailed Specifications.

# 9

# Interrupt Program Activation Function

# 9.1 Interrupt Program Activation Function

## 9.1.1 Overview of Interrupt Program

- The high-speed counter unit can activate interrupt programs of CPU using comparison match flags.
- If the activation condition is met, the interrupt program of a corresponding program number will be activated. Once the execution of the interrupt program is complete, the process returns to the execution of the main program.

■ **Interrupt program specifications**

| Item | Description | |
|---|---|---|
| Interrupt program activation condition | Activates a corresponding interrupt program when the comparison match 0 flag and comparison match 1 flag of each channel turns on. | |
| No. of interrupt programs | Per 1 channel of high-speed counter unit | Max. 2 programs |
| | Per 1 high-speed counter unit | Max. 4 programs (2-ch type High-speed counter unit)<br>Max. 8 programs (4-ch type High-speed counter unit) |
| | Per 1 CPU unit | Max. 64 programs (8 programs x 8 units) |

## 9.1.2 Settings of High-speed Counter Unit

■ **Switch setting of the unit**

For using the interrupt program activation function, it is necessary to set the switch on the side of the unit. Refer to “2.1 Names and Functions of Parts”.

■ **Configuration setting**

Confirm if the comparison function has been set and the interrupt function has been set to "Enable" in the configuration menu.

## 9.1.3 Overview of Interrupt Program

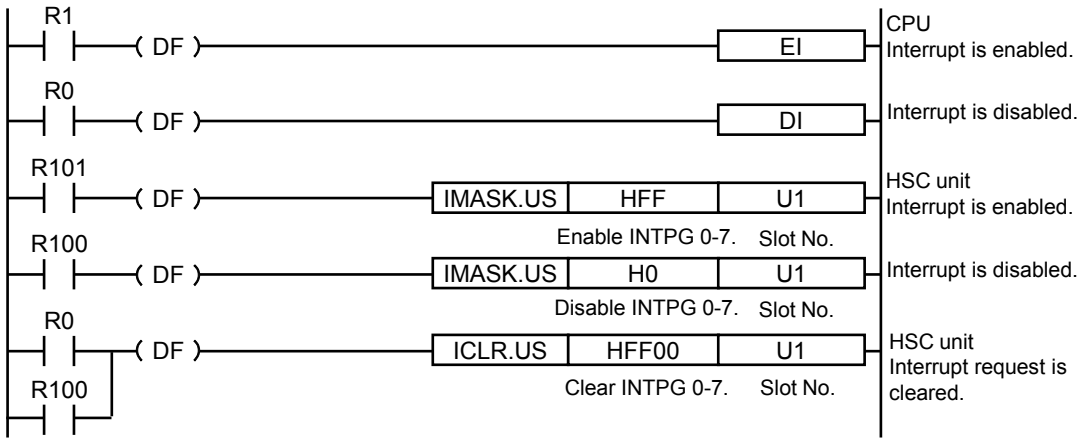
Use the following instructions to execute the interrupt program activation function.

■ **Instructions used for interrupt program activation.**

| Described area | Instruction | Function |
|---|---|---|
| Main program | EI | Allows the interrupt process for the CPU. |
| | DI | Prohibits the interrupt process for the CPU. |
| | IMASK | Allows or prohibits the interrupt process of each unit. |
| | ICLR | Clears the interrupt activation request signal that has not been processed on the unit side when the interrupt program activation is prohibited by DI or IMASK instruction. |
| Interrupt program | INTPG | It is described at the beginning of the interrupt program. |
| | IRET | It is described at the end of the interrupt program. |

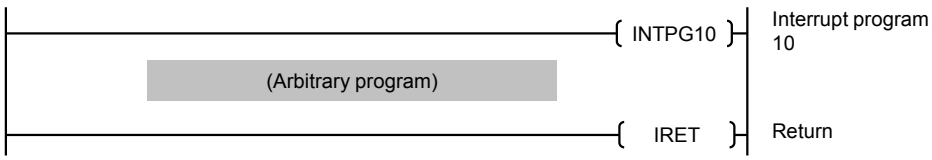
■ **Programming method (Main program)**

The interrupt for the CPU and the interrupt activation of the high-speed counter unit are allowed in the main program. If the interrupt becomes disabled, clear the interrupt activation request signal that is not processed in the unit as necessary.




■ **Programming method (Interrupt program)**

- Describe the program to be executed at the time of interrupt process in the interrupt program.




■ **Corresponding interrupt program number**

| Interrupt program No. | Comparison match flag of high-speed counter unit | Designation of the first operand of IMASK and ICLR instructions |
|---|---|---|
| INTPG 10 | CH0 Comparison match 0 flag | IMASK instruction<br>bit no. 15 … 8 7 … 0<br>Higher 8 bits 0: Fixed<br>INTPG 7<br>⋮<br>INTPG 0<br>0: Disable 1: Enable<br><br>ICLR instruction<br>bit no. 15 … 8 7 … 0<br>Higher 8 bits 1: Fixed<br>INTPG 7<br>⋮<br>INTPG 0<br>0: Clear<br>1: Not clear |
| INTPG 11 | CH0 Comparison match 1 flag | |
| INTPG 12 | CH1 Comparison match 0 flag | |
| INTPG 13 | CH1 Comparison match 1 flag | |
| INTPG 14 | CH2 Comparison match 0 flag | |
| INTPG 15 | CH2 Comparison match 1 flag | |
| INTPG 16 | CH3 Comparison match 0 flag | |
| INTPG 17 | CH3 Comparison match 1 flag | |

(Note 1): Interrupt program numbers are specified with slot numbers + (0 to 7).The numbers in the above table are for the slot 1.
Example) The interrupt program number corresponding to the CH1 comparison match 1 flag of the slot number 1 is INTPG103.

### 9.1.4 Precautions for Use

■ **Process when more than one interrupt activation request is made**

- If more than one interrupt activation request is made from the unit, the process will be carried out from the smallest slot number or the smallest interrupt program number.
- If the interrupt activation is requested on the completion of the process of interrupt program, a higher-priority program will be searched and the corresponding interrupt program will be executed.
- Interrupt activation request signals on the unit side will be held until the corresponding interrupt program is executed or ICLR instruction is executed.

◆ NOTE

- **If interrupt occurs many times in one scan, the execution of interrupt program has priority, and the scan time will be longer.**

# 10

# What to Do If an Error Occurs

# 10.1 Self-diagnostic Function

## 10.1.1 Errors Announced by High-speed Counter Unit

### ■ Operation monitor LEDs of high-speed counter

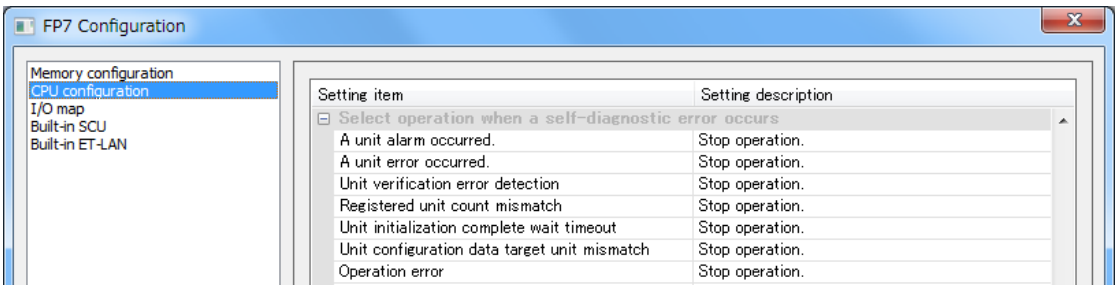
- When an error occurs in the high-speed counter unit, the ERR LED of the unit lights.
- The contents of errors can be confirmed from the error flags and error codes allocated to each channel.
- There are errors which occur at the time of start-up and errors which occur during operations.

### ■ CPU operation when an error occurs in the high-speed counter unit

- If an error occurs in the high-speed counter unit, it will give the information to the CPU as "Unit error".
- If a "Unit error" occurs, the CPU will stop the operation.
- In the programming tool, the error code (81) unit error is displayed.

### ■ Operation mode of the CPU when a unit error occurs

- The operation mode of the CPU at the time a unit error occurs can be changed using the configuration menu of programming tool FPWIN GR7.




## 10.1.2 Confirming Error Code

### ■ Confirmation of error information

- Error codes are stored in unit memories (UM) for each channel.
- Error codes are read by the device monitor function of programming tool FPWIN GR7.

### ■ Allocation of I/O signals and unit memories

| Signal name | CH0 | CH1 | CH2 | CH3 |
|---|---|---|---|---|
| Overflow annunciation | X10D | X12D | X14D | X16D |
| Underflow annunciation | X10E | X12E | X14E | X16E |
| Error annunciation | X10F | X12F | X14F | X16F |
| Error code storage area | UM00025 | UM00026 | UM00027 | UM00028 |

(Note 1): The above I/O numbers are those for the slot number 1 and the starting word number 10. The I/O numbers actually used vary according to the slot number where the unit is installed and the starting word number.

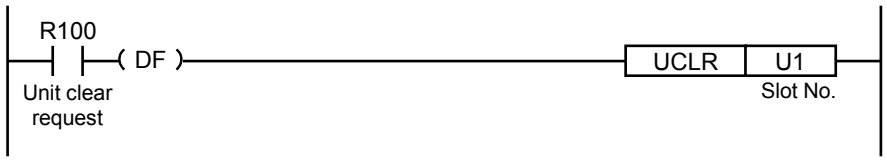
## 10.1.3 Clearing Errors Using User Programs

- Each error can be cleared by user programs.
- Refer to error codes, correct error factors, and clears the errors.

### ■ Clearing all channels by UCLR instruction

- Executing the dedicated instruction UCLR (error) clears errors occurred in the high-speed counter unit.

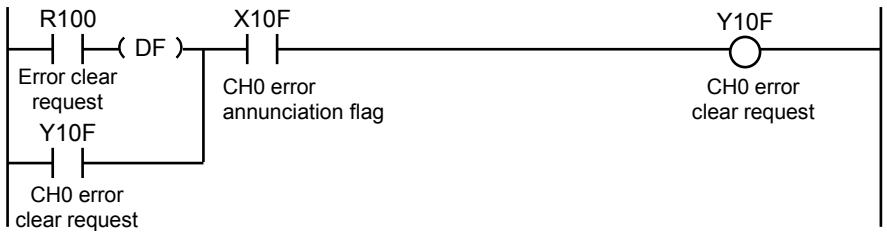
Example) Program to clear errors of the high-speed counter unit installed in the slot No. 1




### ■ Clearing each channel separately by I/O signals

- Turning on the error clear request flag allocated to the I/O area clears errors in each channel separately. The program below shows the error clear of channel 0.
- The overflow or underflow annunciation flag can be cleared by each clear signal, reset or preset operation. However, error states are not cleared.

Example) Program to request for clearing errors of CH0 of the high-speed counter unit installed in the slot No. 1




### ■ Allocation of I/O signals

| Signal name | CH0 | CH1 | CH2 | CH3 |
|---|---|---|---|---|
| Overflow clear | Y10D | Y11D | Y12D | Y13D |
| Underflow clear | Y10E | Y11E | Y12E | Y13E |
| Error clear | Y10F | Y11F | Y12F | Y13F |
| Overflow annunciation | X10D | X12D | X14D | X16D |
| Underflow annunciation | X10E | X12E | X14E | X16E |
| Error annunciation | X10F | X12F | X14F | X16F |

(Note 1): The above I/O numbers are those for the slot number 1 and the starting word number 10. The I/O numbers actually used vary according to the slot number where the unit is installed and the starting word number.

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# 10.2 List of Error Codes

## 10.2.1 Errors in Operation Ready Request (0100H to 0633H)

- These are errors occurred when the operation ready is requested. If these errors occur, the unit will not be ready for operations and the functions set in the unit will not be activated.
- Check if the setting values in the configuration menu or unit memories (UM) are correct.

■ **List of error codes (0100H ~ 0153H)**

| Error code | Channel No. | Error name | | Corresponding unit memory No. |
|---|---|---|---|---|
| 0100H | CH0 | Counter type setting error | | UM 00050 |
| 0101H | CH1 | | | UM 00120 |
| 0102H | CH2 | | | UM 001F0 |
| 0103H | CH3 | | | UM 002C0 |
| 0110H | CH0 | Enable/Disable Overflow/underflow setting error | | UM 00051 |
| 0111H | CH1 | | | UM 00121 |
| 0112H | CH2 | | | UM 001F1 |
| 0113H | CH3 | | | UM 002C1 |
| 0120H | CH0 | Counter upper and lower limits setting error | Upper limit | UM 00052-UM 00053 |
| | | | Lower limit | UM 00054-UM 00055 |
| 0121H | CH1 | | Upper limit | UM 00122-UM 00123 |
| | | | Lower limit | UM 00124-UM 00125 |
| 0122H | CH2 | | Upper limit | UM 001F2-UM 001F3 |
| | | | Lower limit | UM 001F4-UM 001F5 |
| 0123H | CH3 | | Upper limit | UM 002C2-UM 002C3 |
| | | | Lower limit | UM 002C4-UM 002C5 |
| 0130H | CH0 | Count direction setting error | | UM 00056 |
| 0131H | CH1 | | | UM 00126 |
| 0132H | CH2 | | | UM 001F6 |
| 0133H | CH3 | | | UM 002C6 |
| 0140H | CH0 | Count input setting error | | UM 00057 |
| 0141H | CH1 | | | UM 00127 |
| 0142H | CH2 | | | UM 001F7 |
| 0143H | CH3 | | | UM 002C7 |
| 0150H | CH0 | Count method setting error | | UM 00058 |
| 0151H | CH1 | | | UM 00128 |
| 0152H | CH2 | | | UM 001F8 |
| 0153H | CH3 | | | UM 002C8 |

■ **List of error codes (0160H ~ 0313H)**

| Error code | Channel No. | Error name | Corresponding unit memory No. |
|---|---|---|---|
| 0160H | CH0 | Input Z signal function setting error | UM 00059 |
| 0161H | CH1 | | UM 00129 |
| 0162H | CH2 | | UM 001F9 |
| 0163H | CH3 | | UM 002C9 |
| 0170H | CH0 | Control 0 signal function setting error | UM 0005A |
| 0171H | CH1 | | UM 0012A |
| 0172H | CH2 | | UM 001FA |
| 0173H | CH3 | | UM 002CA |
| 0180H | CH0 | Control 1 signal function setting error | UM 0005B |
| 0181H | CH1 | | UM 0012B |
| 0182H | CH2 | | UM 001FB |
| 0183H | CH3 | | UM 002CB |
| 0190H | CH0 | Default value setting error | UM 00060-UM 00061 |
| 0191H | CH1 | | UM 00130-UM 00131 |
| 0192H | CH2 | | UM 00200-UM 00201 |
| 0193H | CH3 | | UM 002D0-UM 002D1 |
| 01A0H | CH0 | Input A signal/Input B signal input time constant setting error | UM 00068 |
| 01A1H | CH1 | | UM 00138 |
| 01A2H | CH2 | | UM 00208 |
| 01A3H | CH3 | | UM 002D8 |
| 01B0H | CH0 | Input Z signal input time constant setting error | UM 00069 |
| 01B1H | CH1 | | UM 00139 |
| 01B2H | CH2 | | UM 00209 |
| 01B3H | CH3 | | UM 002D9 |
| 01C0H | CH0 | Control signal input time constant setting error | UM 0006A |
| 01C1H | CH1 | | UM 0013A |
| 01C2H | CH2 | | UM 0020A |
| 01C3H | CH3 | | UM 002DA |
| 0300H | CH0 | Measurement function selection setting error | UM 00070 |
| 0301H | CH1 | | UM 00140 |
| 0302H | CH2 | | UM 00210 |
| 0303H | CH3 | | UM 002E0 |
| 0310H | CH0 | Pulse number per rotation setting error | UM 00071-UM 00072 |
| 0311H | CH1 | | UM 00141-UM 00142 |
| 0312H | CH2 | | UM 00211-UM 00212 |
| 0313H | CH3 | | UM 002E1-UM 002E2 |

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■ **List of error codes (0320H ~ 0533H)**

| Error code | Channel No. | Error name | Corresponding unit memory No. |
|---|---|---|---|
| 0320H | CH0 | Average number of frequency measurement processes setting error | UM 00073 |
| 0321H | CH1 | | UM 00143 |
| 0322H | CH2 | | UM 00213 |
| 0323H | CH3 | | UM 002E3 |
| 0330H | CH0 | Average number of rotation speed measurement processes setting error | UM 00074 |
| 0331H | CH1 | | UM 00144 |
| 0332H | CH2 | | UM 00214 |
| 0333H | CH3 | | UM 002E4 |
| 0400H | CH0 | Comparison function selection setting error | UM 00078 |
| 0401H | CH1 | | UM 00148 |
| 0402H | CH2 | | UM 00218 |
| 0403H | CH3 | | UM 002E8 |
| 0410H | CH0 | Comparison input selection setting error | UM 00079 |
| 0411H | CH1 | | UM 00149 |
| 0412H | CH2 | | UM 00219 |
| 0413H | CH3 | | UM 002E9 |
| 0430H | CH0 | Number of comparison data setting error | UM 0007B |
| 0431H | CH1 | | UM 0014B |
| 0432H | CH2 | | UM 0021B |
| 0433H | CH3 | | UM 002EB |
| 0500H | CH0 | External output 0 signal setting error | UM 00100 |
| 0501H | CH1 | | UM 001D0 |
| 0502H | CH2 | | UM 002A0 |
| 0503H | CH3 | | UM 00370 |
| 0510H | CH0 | External output 0 signal output hold setting error | UM 00101 |
| 0511H | CH1 | | UM 001D1 |
| 0512H | CH2 | | UM 002A1 |
| 0513H | CH3 | | UM 00371 |
| 0520H | CH0 | External output 0 signal ON timing delay setting error | UM 00102 |
| 0521H | CH1 | | UM 001D2 |
| 0522H | CH2 | | UM 002A2 |
| 0523H | CH3 | | UM 00372 |
| 0530H | CH0 | External output 0 signal ON hold time setting error | UM 00103 |
| 0531H | CH1 | | UM 001D3 |
| 0532H | CH2 | | UM 002A3 |
| 0533H | CH3 | | UM 00373 |

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■ **List of error codes (0540H ~ 0633H)**

| Error code | Channel No. | Error name | Corresponding unit memory No. |
|---|---|---|---|
| 0540H | CH0 | External output 1 signal setting error | UM 00104 |
| 0541H | CH1 | | UM 001D4 |
| 0542H | CH2 | | UM 002A4 |
| 0543H | CH3 | | UM 00374 |
| 0550H | CH0 | External output 1 signal output hold setting error | UM 00105 |
| 0551H | CH1 | | UM 001D5 |
| 0552H | CH2 | | UM 002A5 |
| 0553H | CH3 | | UM 00375 |
| 0560H | CH0 | External output 1 signal ON timing delay setting error | UM 00106 |
| 0561H | CH1 | | UM 001D6 |
| 0562H | CH2 | | UM 002A6 |
| 0563H | CH3 | | UM 00376 |
| 0570H | CH0 | External output 1 signal ON hold time setting error | UM 00107 |
| 0571H | CH1 | | UM 001D7 |
| 0572H | CH2 | | UM 002A7 |
| 0573H | CH3 | | UM 00377 |
| 0600H | CH0 | Capture 0 setting error | UM 00110 |
| 0601H | CH1 | | UM 001E0 |
| 0602H | CH2 | | UM 002B0 |
| 0603H | CH3 | | UM 00380 |
| 0610H | CH0 | Capture 1 setting error | UM 00111 |
| 0611H | CH1 | | UM 001E1 |
| 0612H | CH2 | | UM 002B1 |
| 0613H | CH3 | | UM 00381 |
| 0620H | CH0 | Sampling capture function operation setting error | UM 00112 |
| 0621H | CH1 | | UM 001E2 |
| 0622H | CH2 | | UM 002B2 |
| 0623H | CH3 | | UM 00382 |
| 0630H | CH0 | Sampling time setting error | UM 00113 |
| 0631H | CH1 | | UM 001E3 |
| 0632H | CH2 | | UM 002B3 |
| 0633H | CH3 | | UM 00383 |

## 10.2.2 Errors Occurred in Operations (1000H to 1043H)

- These are errors occurred in operations.
- Take steps according to the contents in the table below.

■ **List of error codes**

| Error code | Channel No. | Error name | Content | Operation | Countermeasures |
|---|---|---|---|---|---|
| 1000H | CH0 | Overflow error | The count value exceeds the upper limit. | Announces the overflow error. Holds the count value. | Performs the reset or preset operation to make the count value be in the range of upper and lower limits. |
| 1001H | CH1 | | | | |
| 1002H | CH2 | | | | |
| 1003H | CH3 | | | | |
| 1010H | CH0 | Underflow error | The count value exceeds the lower limit. | Announces the underflow error. Holds the count value. | Performs the reset or preset operation to make the count value be in the range of upper and lower limits. |
| 1011H | CH1 | | | | |
| 1012H | CH2 | | | | |
| 1013H | CH3 | | | | |
| 1020H | CH0 | Reset error | The count value becomes 0 under the reset condition, and it is outside the range of upper and lower limits. | Does not reset. Continues the count operation. | Confirm the settings of the upper and lower limits of counter. If 0 does not exist in the range of the upper and lower limits, make the preset request. |
| 1021H | CH1 | | | | |
| 1022H | CH2 | | | | |
| 1023H | CH3 | | | | |
| 1030H | CH0 | Preset error | The count value is outside the range of upper and lower limits under the preset condition. | Does not preset. Continues the count operation. | Confirm if the specified preset value is in the range of upper and lower limits. |
| 1031H | CH1 | | | | |
| 1032H | CH2 | | | | |
| 1033H | CH3 | | | | |
| 1040H | CH0 | Current value change error | The count value is outside the range of upper and lower limits when the current value is changed. | Does not change the current value. Continues the count operation. | Confirm if the current value changed value is in the range of upper and lower limits. |
| 1041H | CH1 | | | | |
| 1042H | CH2 | | | | |
| 1043H | CH3 | | | | |

# 11

# Specifications

# 11.1 Specifications

## 11.1.1 General Specifications

| Items | Description |
|---|---|
| Operating ambient temperature | 0°C to +55°C |
| Storage ambient temperature | -40°C to +70°C |
| Operating ambient humidity | 10% to 95%RH (at 25°C with no-condensing) |
| Storage ambient humidity | 10% to 95%RH (at 25°C with no-condensing) |
| Breakdown voltage | Between I/O terminals and CPU power supply terminal/function earth<br>Bewteen input terminal and output terminals<br>500 VAC for 1 min. (Cutoff current: 10 mA, factory default setting) |
| Insulation resistance | Between I/O terminals and CPU power supply terminal/function earth<br>Bewteen input terminal and output terminals<br>100 MΩ or more (with 500 VDC megohmmeter) |
| Vibration resistance | Conforming to JISB3502 and IEC61131-2.<br>5 to 8.4 Hz, 3.5-mm single amplitude<br>8.4 to 150 Hz, acceleration of 9.8 m/s2<br>10 sweeps each in X, Y, and Z directions (1 octave/min) |
| Shock resistance | Conforming to JISB3502 and IEC61131-2.<br>147 $m/s^2$ or more in X, Y, and Z directions three times each |
| Noise resistance | 1,000 V [P-P] with pulse width of 1 μs or 50 ns<br>(based on in-house measurements) |
| Environment | Free from corrosive gases and excessive dust |
| EU Directive applicable standard | EMC Directive: EN61131-2 |
| Overvoltage category | Category II |
| Pollution degree | Pollution level 2 |
| Internal current consumption | 65 mA or less |
| Weight | Approx. 130 g |

## 11.1.2 Function Specifications

| Items | | Description | |
|---|---|---|---|
| Count function | Product No. | AFP7HSC2T | AFP7HSC4T |
| | No. of counters | 2-ch type | 4-ch type |
| | Counter type | Linear counter, Ring counter | |
| | Counting range | Signed 32-bit (-2,147,483,648 to +2,147,483,647) | |
| | Max. input frequency | 4MHz/8MHz for individual input (phases A and B) (Duty ratio 50±10%)<br>4MHz/8MHz for direction detection input (Duty ratio 50%±10%)<br>4MHz/8MHz for 2-phase input (Duty ratio 50±10%, Phase shifting below 5%) | |
| | Input signal | Phases A, B and Z | |
| | External I/O | - Control signal input: 4 points (2 points/ch)<br>- External output: 4 points (2 points/ch) | - Control signal input: 8 points (2 points/ch)<br>- External output: 8 points (2 points/ch) |
| | Input type | - 2-phase input (Phase difference input) 1 multiple, 2 multiple, 4 multiple<br>- Individual input 1 multiple, 2 multiple<br>- Direction detection input 1 multiple, 2 multiple | |
| | Count operation function | Count operation can be controlled by input signals in combination with three functions.<br>- Counter enable function (Control signal/Output Y relay)<br>- Preset function (Input Z signal/Output Y relay)<br>- Preset function (Input Z signal/Output Y relay)<br>Only for control signals, the enable function and reset function or preset function can be combined. The count operation is set by selecting from the following operations.<br>- Reset operation at rising edge<br>- Reset operation at trailing edge<br>- Positive logic reset operation<br>- Negative logic reset operation<br>- Preset operation at rising edge<br>- Preset operation at trailing edge<br>- Positive logic preset operation<br>- Negative logic preset operation<br>- Positive logic enable operation<br>- Negative logic enable operation<br>- Positive logic enable operation and reset operation at rising edge<br>- Negative logic enable operation and reset operation at trailing edge<br>- Positive logic enable operation and preset operation at rising edge<br>- Negative logic enable operation and preset operation at trailing edge | |
| Measurement function | Frequency measurement function | Measures the intervals between the changes in the count value, and calculates the frequency. | |
| | Rotation speed measurement A function | Measures the intervals between the changes in the count value, and automatically calculates the rotation speed. | |
| | Rotation speed measurement B function | Measures the time for the number of counts equivalent to one rotation. Sets the time to reach the specified number of pulses per one rotation, and calcualtes the rotation speed from the time required for one rotation. | |

| Items | | Description | |
|---|---|---|---|
| Comparison function | No. of comparison data | Max. 16 data/ch (Comparison data 0 to Comparison data 15) | |
| | Comparison match flag | Max. 16 points/ch (Comparison match 0 flag to Comparison match F flag)<br>Read as input relays (X) by user programs.<br>Multiple comparison match flags can be set for one comparison data. | |
| | Target value match function | Depending on the count direction, sets or resets the output when the count value reaches the target value. | |
| | Band comparison function | Turns on/off the output when the count value reaches the area of the target value. | |
| External output function | No. of external outputs | 2 points/ch<br>Comparison match 0 flag and comparison match 1 flag can be allocated to external outputs. | |
| | Comparison result output function | When using the band comparison function, the ON timing characteristics of external output relays can be changed.<br>ON timing delay<br>ON hold time<br>ON timing delay and ON hold time | |
| | Forced output function | Outpus can be forcibly set or reset by the monitor function of programming tool. | |
| Other functions | Capture function | Stores the count value when the control signal turns on in the capture register. Either one of the following functions is usable. | |
| | | Capture function | Max. 2 points<br>Stores the count value when the capture trigger turns on in the capture register. |
| | | Sampling capture function | Max. 1 point<br>Stores the count values for a specified sampling time when the capture trigger turns on in the capture register. |
| | Interrupt function | Activates corresponding interrupt programs when the comparison match 0 flag and comparison match 1 flag of each channel turns on. (Note 1) (Note 2) | |
| | | Per 1 channel of high-speed counter unit | Max. 2 programs |
| | | Per 1 high-speed counter unit | Max. 4 programs (2-ch type High-speed counter unit), Max. 8 programs (4-ch type High-speed counter unit) |
| | | Per 1 CPU unit | Max. 64 programs (8 programs x 8 units) |
| | Initial value of counter | The count value overwrites the initial value when the power turns on. | |
| | Input time constant | Input time constant (noise filter) can be set to reduce noises of input signal lines. | |
| | | Input A signal, input B signal (The same time constant for the both signals) | 0.1 μs (2 MHz), 0.2 μs (1 MHz),<br>0.5 μs(500 kHz), 1.0 μs (250 kHz),<br>2.0 μs (100 kHz), 10.0 μs (10 kHz) |
| | | Input Z signal | 0.1 μs (2 MHz), 0.2 μs (1 MHz),<br>0.5 μs (500 kHz), 1.0 μs (250 kHz),<br>2.0 μs (100 kHz), 10.0 μs (10 kHz) |
| | | Control signal | 2 μs, 5 μs, 10 μs, 20 μs, 50 μs, 100 μs, 500 μs, 1 ms, 2 ms, 5 ms, 10ms |

(Note 1) If interrupt occurs many times in one scan, the execution of intterupt program has priority, and the scan time will be longer.

(Note 2) If more than one interrupt activation request is made from the unit, the process will be carried out from the smallest slot number or the smallest interrupt program number.

## 11.2 Allocation of I/O Numbers

■ **Input relays**

| I/O number | | | | | | | | Name | Description |
|---|---|---|---|---|---|---|---|---|---|
| CH0 | | CH1 | | CH2 | | CH3 | | | |
| WX0 | X0 | WX2 | X20 | WX4 | X40 | WX6 | X60 | Operation ready done | Flag to indicate the counter operation is ready. |
| | X1 | | X21 | | X41 | | X61 | Counter enable | Flag to indicate the counter operation is enabled. |
| | X2 | | X22 | | X42 | | X62 | Count direction | Flag to indicate a count direction.<br>ON: Forward (Addition) OFF: Reverse (Subtraction) |
| | X3 | | X23 | | X43 | | X63 | — | — |
| | X4 | | X24 | | X44 | | X64 | Capture 0 done flag | Flag to announce that the count value is stored in capture 0 register. |
| | X5 | | X25 | | X45 | | X65 | Capture 1 done flag | Flag to announce that the count value is stored in capture 1 register. |
| | X6 | | X26 | | X46 | | X66 | External output 0 signal monitor | Monitors the output state of external output 0 signal. |
| | X7 | | X27 | | X47 | | X67 | External output 1 signal monitor | Monitors the output state of external output 1 signal. |
| | X8 | | X28 | | X48 | | X68 | Input A signal monitor | Monitors the input state of input A signal. |
| | X9 | | X29 | | X49 | | X69 | Input B signal monitor | Monitors the input state of input B signal. |
| | XA | | X2A | | X4A | | X6A | Input Z signal monitor | Monitors the input state of input Z signal. |
| | XB | | X2B | | X4B | | X6B | Control 0 signal monitor | Monitors the output state of control 0 signal. |
| | XC | | X2C | | X4C | | X6C | Control 1 signal monitor | Monitors the output state of control 1 signal. |
| | XD | | X2D | | X4D | | X6D | Overflow annunciation | Flag to announce the occurrence of overflow (Enabled for the linear counter only.) |
| | XE | | X2E | | X4E | | X6E | Underflow annunciation | Flag to announce the occurrence of underflow (Enabled for the linear counter only.) |
| | XF | | X2F | | X4F | | X6F | Error annunciation | Flag to announce the occurrence of an error. |
| WX1 | X10 ~ X19 | WX3 | X30 ~ X39 | WX5 | X50 ~ X59 | WX7 | X70 ~ X79 | Comparison match 0 flag to Comparison match 9 flag | Flag to reflect the results of the band comparison function or target value match function. |
| | X1A ~ X1F | | X3A ~ X3F | | X5A ~ X5F | | X7A ~ X7F | Comparison match A flag to Comparison match F flag | |

(Note 1): The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit.
Example) When the starting word number for the unit is "10", the operation ready done flag for CH0 is X100.

■ **Output relays**

| I/O number | | | | | | | | Name | Effective condition | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| CH0 | | CH1 | | CH2 | | CH3 | | | | |
| WY0 | Y0 | WY1 | Y10 | WY2 | Y20 | WY3 | Y30 | Operation ready request | Level | Relay to recalculate the setting parameter of counter. |
| | Y1 | | Y11 | | Y21 | | Y31 | Count enable request | Level | Relay to start the counter operation. |
| | Y2 | | Y12 | | Y22 | | Y32 | Reset request | ON edge | Relay to reset count values. |
| | Y3 | | Y13 | | Y23 | | Y33 | Preset request | ON edge | Relay to preset count values. |
| | Y4 | | Y14 | | Y24 | | Y34 | Reset enable request | Level | Relay to enable the reset by the control signal and input Z signal. |
| | Y5 | | Y15 | | Y25 | | Y35 | Current value change request | ON edge | Relay to request for changing the current value of counter. |
| | Y6 | | Y16 | | Y26 | | Y36 | Preset value change request | ON edge | Relay to request for changing preset values. |
| | Y7 | | Y17 | | Y27 | | Y37 | Capture enable request (Note 2) | Level | Capture enable request when using the capture function or capture trigger signal when using the sampling capture function. |
| | Y8 | | Y18 | | Y28 | | Y38 | — | — | — |
| | Y9 | | Y19 | | Y29 | | Y39 | External output 0 forced ON | Level | Relay to forcibly turn on the external output 0. |
| | YA | | Y1A | | Y2A | | Y3A | External output 0 forced OFF | Level | Relay to forcibly turn off the external output 0. |
| | YB | | Y1B | | Y2B | | Y3B | External output 1 forced ON | Level | Relay to forcibly turn on the external output 1. |
| | YC | | Y1C | | Y2C | | Y3C | External output 1 forced OFF | Level | Relay to forcibly turn off the external output 1. |
| | YD | | Y1D | | Y2D | | Y3D | Overflow clear | ON edge | Relay to clear the overflow annunciation flag. |
| | YE | | Y1E | | Y2E | | Y3E | Underflow clear | ON edge | Relay to clear the underflow annunciation flag. |
| | YF | | Y1F | | Y2F | | Y3F | Error clear | ON edge | Relay to clear errors. |

(Note 1): The I/O numbers in the table indicates offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit.
Example) When the starting word number for the unit is "10", the operation ready request flag for CH0 is Y100.

(Note 2) How the capture enable request signal works varies according to the functions to be used.

# 11.3 List of Unit Memories

■ **Check list of unit memories**

| Setting monitor item | | Unit memory (UM) number | | | |
|---|---|---|---|---|---|
| | | CH0 | CH1 | CH2 | CH3 |
| Common setting area | Error code | UM 00025 | UM 00026 | UM 00027 | UM 00028 |
| Individual setting area | Count function setting area | UM 00050 - UM 0006F | UM 00120 - UM 0013F | UM 001F0 - UM 0020F | UM 002C0 - UM 002DF |
| | Measurement function setting area | UM 00070 - UM 00077 | UM 00140 - UM 00147 | UM 00210 - UM 00217 | UM 002E0 - UM 002E7 |
| | Comparison function setting area | UM 00078 - UM 000FF | UM 00148 - UM 001CF | UM 00218 - UM 0029F | UM 002E8 - UM 0036F |
| | External output function setting area | UM 00100 - UM 0010F | UM 001D0 - UM 001DF | UM 002A0 - UM 002AF | UM 00370 - UM 0037F |
| | Capture function setting area | UM 00110 - UM 00117 | UM 001E0 - UM 001E7 | UM 002B0 - UM 002B7 | UM 00380 - UM 00387 |
| | Interrupt function setting area | UM00118 - UM0011F | UM001E8 - UM 001EF | UM002B8 - UM 002BF | UM00388 - UM 0038F |
| Monitor area | Count value | UM003A0 - UM003A1 | UM003B0 - UM003B1 | UM003C0 - UM003C1 | UM003D0 - UM003D1 |
| | Capture 0 register | UM003A2 - UM003A3 | UM003B2 - UM003B3 | UM003C2 - UM003C3 | UM003D2 - UM003D3 |
| | Capture 1 register | UM003A4 - UM003A5 | UM003B4 - UM003B5 | UM003C4 - UM003C5 | UM003D4 - UM003D5 |
| | Capture register difference value | UM003A6 - UM003A7 | UM003B6 - UM003B7 | UM003C6 - UM003C7 | UM003D6 - UM003D7 |
| | Frequency measurement (Averaging) | UM003A8 - UM003A9 | UM003B8 - UM003B9 | UM003C8 - UM003C9 | UM003D8 - UM003D9 |
| | Rotation speed measurement (Averaging) | UM003AA - UM003AB | UM003BA - UM003BB | UM003CA - UM003CB | UM003DA - UM003DB |

(Note 1): For information on the memory numbers actually used, refer to each items of "11.4 Unit Memory Detailed Specifications". The above list includes empty areas which are reserved in the system. Do not read empty areas or write into empty areas.

■ **Check list of unit memories**

| Setting monitor item | | Unit memory (UM) No. | | | |
|---|---|---|---|---|---|
| | | CH0 | CH1 | CH2 | CH3 |
| Capture value buffer area | Number of completed capture 0 operations | UM00400 | UM00600 | UM00800 | UM00A00 |
| | Capture 0 register (Buffer 1 to Buffer 60) | UM00402 - UM00479 | UM00602 - UM00679 | UM00802 - UM00879 | UM00A02 - UM00A79 |
| | Capture 0 register difference value (Buffer 1 to Buffer 60) | UM00482 - UM004F9 | UM00682 - UM006F9 | UM00882 - UM008F9 | UM00A82 - UM00AF9 |
| | Number of completed capture 1 operations | UM00500 | UM00700 | UM00900 | UM00B00 |
| | Capture 1 register (Buffer 1 to Buffer 60) | UM00502 - UM00579 | UM00702 - UM00779 | UM00902 - UM00979 | UM00B02 - UM00B79 |
| | Capture 1 register difference value (Buffer 1 to Buffer 60) | UM00582 - UM005F9 | UM00782 - UM007F9 | UM00982 - UM009F9 | UM00B82 - UM00BF9 |

(Note 1): For information on the memory numbers actually used, refer to each items of "11.4 Unit Memory Detailed Specifications". The above list includes empty areas which are reserved in the system. Do not read empty areas or write into empty areas.

# 11.4 Unit Memory Detailed Specifications

## 11.4.1 Common Setting Area

■ **Error code**

| Unit memory No.(Hex) | Name | Default | Setting range and description |
|---|---|---|---|
| UM 00025 | ch0 Error code | H0 | Stores error code for each channel. Refer to the error code list. |
| UM 00026 | ch1 Error code | H0 | |
| UM 00027 | ch2 Error code | H0 | |
| UM 00028 | ch3 Error code | H0 | |

## 11.4.2 Individual Setting Area

■ **Count function**

| Unit memory No.(Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00050<br>UM 00120<br>UM 001F0<br>UM 002C0 | Counter type | H0 | Set the type of counter.<br>H0: Linear counter<br>H1: Ring counter | — |
| UM 00051<br>UM 00121<br>UM 001F1<br>UM 002C1 | Enable/Disable overflow/ underflow | H0 | Set whether to enable or disable the overflow/underflow judgement.<br>H0: Disable, H1: Enable<br>Annunciation using overflow and underflow flags of each channel and error codes. However, when it is set to disable, the upper and lower limits are disregarded and counting continues. | — |
| UM 00052<br>UM 00053<br>UM 00122<br>UM 00123<br>UM 001F2<br>UM 001F3<br>UM 002C2<br>UM 002C3 | Counter upper limit | U 2,147,483,647 | Set the upper limit of counter.<br>Setting range: -2,147,483,647 (8000 0001H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit<br>However, the upper limit should be larger than the lower limit.<br>A setting error occurs when the upper limit is equal to the lower limit or smaller than the lower limit. | Pulse |
| UM 00054<br>UM 00055<br>UM 00124<br>UM 00125<br>UM 001F4<br>UM 001F5<br>UM 002C4<br>UM 002C5 | Counter lower limit | U -2,147,483,648 | Set the lower limit of counter.<br>Setting range: -2,147,483,648 (8000 0000H) to 2,147,483,646 (7FFF FFFEH)<br>Signed 32-bit<br>However, the upper limit should be larger than the lower limit.<br>A setting error occurs when the upper limit is equal to the lower limit or smaller than the lower limit. | Pulse |

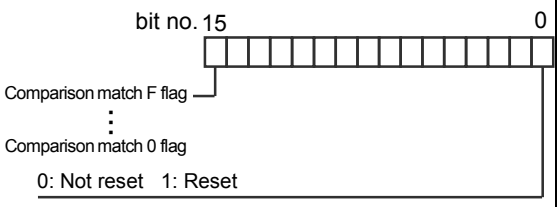
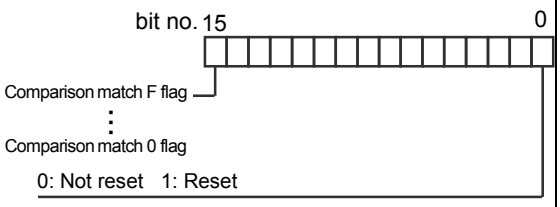
(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

## ■ Count function

| Unit memory No.(Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00056<br>UM 00126<br>UM 001F6<br>UM 002C6 | Specify count direction | H0 | Set the direction of count.<br>H0: Count in normal direction<br>H1: Count in reverse direction | — |
| UM 00057<br>UM 00127<br>UM 001F7<br>UM 002C7 | Select count input | H0 | Select a signal for counting from the count signal, internal clock or internal control signal.<br>H0: Count signal<br>H1: Internal clock 0.25 us (4 MHz)<br>H2: Internal clock 1.00 us (1 MHz)<br>H3: Internal clock 10 us (100 kHz)<br>H4: Internal clock 100 us (10 kHz)<br>H7: Internal control signal | — |
| UM 00058<br>UM 00128<br>UM 001F8<br>UM 002C8 | Count method | H0 | Set the count method.<br>H0: 2-phase input 1 multiple<br>H1: 2-phase input 2 multiple<br>H2: 2-phase input 4 multiple<br>H3: Individual input 1 multiple<br>H4: Individual input 2 multiple<br>H5: Direction detection input 1 multiple<br>H6: Direction detection input 2 multiple | — |
| UM 00059<br>UM 00129<br>UM 001F9<br>UM 002C9 | Input Z signal function setting | H0 | Set counter operations by the input Z signal.<br>H0: Not used<br>H1: Reset operation at rising edge<br>H2: Reset operation at trailing edge<br>H3: Positive logic reset operation<br>H4: Negative logic reset operation<br>H5 : Preset operation at rising edge<br>H6 : Preset operation at trailing edge<br>H7: Positive logic preset operation<br>H8: Negative logic preset operation | — |
| UM 0005A<br>UM 0012A<br>UM 001FA<br>UM 002CA | Control 0 signal function setting | H0 | Set counter operations by the control 0 signal.<br>H0: Not used<br>H1: Positive logic enable operation<br>H2: Negative logic enable operation<br>H3: Positive logic enable operation, reset operation at rising edge<br>H4: Negative logic enable operation and reset operation at trailing edge<br>H5: Positive logic enable operation and preset operation at rising edge<br>H6: Negative logic enable operation and preset operation at trailing edge | — |
| UM 0005B<br>UM 0012B<br>UM 001FB<br>UM 002CB | Control 1 signal function setting | H0 | Set counter operations by the control 1 signal.<br>H0: Not used<br>H1: Positive logic enable operation<br>H2: Negative logic enable operation | — |

(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

■ **Count function**

| Unit memory No.(Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 0005C<br>UM 0012C<br>UM 001FC<br>UM 002CC | Comparison match leading edge reset | H0 | Set to reset the counter when the comparison match flag rises.<br>  | — |
| UM 0005D<br>UM 0012D<br>UM 001FD<br>UM 002CD | Comparison match trailing edge reset | H0 | Set to reset the counter when the comparison match flag falls.<br>  | — |
| UM 00060<br>UM 00061 | Default | U0 | Set the default value used when the power turns on.<br>Setting range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| UM 00130<br>UM 00131 | | | | |
| UM 00200<br>UM 00201 | | | | |
| UM 002D0<br>UM 002D1 | | | | |
| UM 00062<br>UM 00063 | Preset value | U0 | Set the preset value.<br>Setting range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| UM 00132<br>UM 00133 | | | | |
| UM 00202<br>UM 00203 | | | | |
| UM 002D2<br>UM 002D3 | | | | |
| UM 00064<br>UM 00065 | Current value changed value | U0 | Set the current value changed value to change the current count value of counter.<br>Setting range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| UM 00134<br>UM 00135 | | | | |
| UM 00204<br>UM 00205 | | | | |
| UM 002D4<br>UM 002D5 | | | | |

(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

■ **Count function0**

| Unit memory No.(Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00068<br>UM 00138<br>UM 00208<br>UM 002D8 | Input A signal/Input B signal input time constant | H5 | Set the input time constants of input A signal and input B signal.<br>H0: No input time constant<br>H1: 0.1 us(2 MHz)<br>H2: 0.2 us(1 MHz)<br>H3: 0.5 us(500 kHz)<br>H4: 1.0 us(250 kHz)<br>H5: 2.0 us(100 kHz)<br>H6:10.0 us(10 kHz)<br>H7: Disable (No input time constant) | — |
| UM 00069<br>UM 00139<br>UM 00209<br>UM 002D9 | Input Z signal input time constant | H5 | Set the input time constant of input Z signal.<br>H0: No input time constant<br>H1: 0.1 us(2 MHz)<br>H2: 0.2 us(1 MHz)<br>H3: 0.5 us(500 kHz)<br>H4: 1.0 us(250 kHz)<br>H5: 2.0 us(100 kHz)<br>H6:10.0 us(10 kHz)<br>H7: Disable (No input time constant) | — |
| UM 0006A<br>UM 0013A<br>UM 0020A<br>UM 002DA | Control signal input time constant | H9 | Set the input time constant of control signal.<br>H0: No input time constant<br>H1: 2 us<br>H2: 5 us<br>H3: 10 us<br>H4: 20 us<br>H5: 50 us<br>H6: 100 us<br>H7: 500 us<br>H8: 1.0 ms<br>H9: 2.0 ms<br>HA: 5.0 ms<br>HB: 10.0 ms<br>HC: Disable (No input time constant)<br>HD: Disable (No input time constant)<br>HE: Disable (No input time constant)<br>HF: Disable (No input time constant) | — |

(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

## ■ Measurement function

| Unit memory No.(Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00070<br>UM 00140<br>UM 00210<br>UM 002E0 | Select measurement function | H0 | Select a measurement function from frequency measurement, rotation speed measurement A or rotation speed measurement B.<br>H0: Not use measurement function<br>H1: Frequency measurement<br>H2: Frequency measurement and rotation speed measurement A<br>H3: Frequency measurement and rotation speed measurement B | — |
| UM 00071<br>UM 00072<br>UM 00141<br>UM 00142<br>UM 00211<br>UM 00212<br>UM 002E1<br>UM 002E2 | Pulse number per rotation | U1 | Set the pulse number for one rotation of the encoder.<br>Setting range: 1 to 1,048,575 (The values out of the setting range are invalid.) | Pulse |
| UM 00073<br>UM 00143<br>UM 00213<br>UM 002E3 | Set averange number of frequency measurement processes | H0 | Set the number of averaging of frequency measurement values.<br>H0: No averaging<br>H1: 2 times<br>H2: 4 times<br>H3: 8 times<br>H4: 16 times<br>H5: 32 times<br>H6: 64 times<br>H7: 128 times | Times |
| UM 00074<br>UM 00144<br>UM 00214<br>UM 002E4 | Set average number of rotation speed measurement processes | H0 | Set the number of averaging of rotation speed measurement values.<br>H0: No averaging<br>H1: 2 times<br>H2: 4 times<br>H3: 8 times<br>H4: 16 times<br>H5: 32 times<br>H6: 64 times<br>H7: 128 times | Times |

(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

## ■ Comparison function

| Unit memory No.(Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00078<br>UM 00148<br>UM 00218<br>UM 002E8 | Select comparison function | H0 | Select a method of the comparison function from band comparison or target value match comparison.<br>H0: Not use<br>H1: Band comparison<br>H2: Target value match comparison | — |
| UM 00079<br>UM 00149<br>UM 00219<br>UM 002E9 | Select comparison input | H0 | Select a target of the comparison function from count value or measurement value.<br>H0: Count value<br>H1: Measurement value (Frequency)<br>H2: Measurement value (Rotation speed) | — |
| UM 0007B<br>UM 0014B<br>UM 0021B<br>UM 002EB | Set number of comparison data | U16 | Set the judgement value for the comparison function.<br>Setting range: 1 to 16 (The values out of the setting range are invalid.) | Times |
| UM 00080<br>UM 00150<br>UM 00220<br>UM 002F0 | Comparison data 0 | H0 | - Areas in which the output patterns of comparison data and comparison match flags are stored.<br>- The formats of storage areas differ between the target value match comparison and the band comparison.<br>- Each item occupies 8-word area. The unit memory numbers (UM) indicate starting addresses.<br>- For details of the format of target value match comparison, refer to 7.1.2 Target Value Match Comparison and Band Comparison.<br>- For details of the format of band comparison, refer to 7.3.3 Configuration of Band Comparison. | — |
| UM 00088<br>UM 00158<br>UM 00228<br>UM 002F8 | Comparison data 1 | H0 | | — |
| UM 00090<br>UM 00160<br>UM 00230<br>UM 00300 | Comparison data 2 | H0 | | — |
| UM 00098<br>UM 00168<br>UM 00238<br>UM 00308 | Comparison data 3 | H0 | | — |
| UM 000A0<br>UM 00170<br>UM 00240<br>UM 00310 | Comparison data 4 | H0 | | — |
| UM 000A8<br>UM 00178<br>UM 00248<br>UM 00318 | Comparison data 5 | H0 | | — |
| UM 000B0<br>UM 00180<br>UM 00250<br>UM 00320 | Comparison data 6 | H0 | | — |

(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

■ **Comparison function**

| Unit memory No.(Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 000B8<br>UM 00188<br>UM 00258<br>UM 00328 | Comparison data 7 | H0 | - Set the data for band comparison or target value match comparison.<br>- The formats to be set differ between the band comparison and the target value match comparison.<br>- Each item occupies 8-word area. The unit memory numbers (UM) indicate starting addresses.<br>- For details of the format of target value match comparison, refer to 7.1.2 Target Value Match Comparison and Band Comparison.<br>- For details of the format of band comparison, refer to 7.3.3 Configuration of Band Comparison. | — |
| UM 000C0<br>UM 00190<br>UM 00260<br>UM 00330 | Comparison data 8 | H0 | | — |
| UM 000C8<br>UM 00198<br>UM 00268<br>UM 00338 | Comparison data 9 | H0 | | — |
| UM 000D0<br>UM 001A0<br>UM 00270<br>UM 00340 | Comparison data 10 | H0 | | — |
| UM 000D8<br>UM 001A8<br>UM 00278<br>UM 00348 | Comparison data 11 | H0 | | — |
| UM 000E0<br>UM 001B0<br>UM 00280<br>UM 00350 | Comparison data 12 | H0 | | — |
| UM 000E8<br>UM 001B8<br>UM 00288<br>UM 00358 | Comparison data 13 | H0 | | — |
| UM 000F0<br>UM 001C0<br>UM 00290<br>UM 00360 | Comparison data 14 | H0 | | — |
| UM 000F8<br>UM 001C8<br>UM 00298<br>UM 00368 | Comparison data 15 | H0 | | — |

(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

■ **External output function**

| Unit memory No.(Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00100<br>UM 001D0<br>UM 002A0<br>UM 00370 | External output 0 signal setting | H0 | Set whether or not to output the comparison match 0 flag to the external output 0 signal.<br>H0: Not output<br>H1: Output | — |
| UM 00101<br>UM 001D1<br>UM 002A1<br>UM 00371 | External output 0 signal output hold setting | H0 | Set whether or not to hold the output signal in the program mode when an error occurs.<br>H0: Not hold<br>H1: Hold | — |
| UM 00102<br>UM 001D2<br>UM 002A2<br>UM 00372 | External output 0 signal ON timing delay | U0 | Set the ON timing delay of external output 0 signal.<br>Setting range: 0 to 1,000 (The values out of the setting range are invalid.) | ms |
| UM 00103<br>UM 001D3<br>UM 002A3<br>UM 00373 | External output 0 signal ON hold time | U0 | Set the ON hold time of external output 0 signal.<br>Setting range: 0 to 1,000 (The values out of the setting range are invalid.) | ms |
| UM 00104<br>UM 001D4<br>UM 002A4<br>UM 00374 | External output 1 signal setting | H0 | Set whether or not to output the comparison match 1 flag to the external output 1 signal.<br>H0: Not output<br>H1: Output | — |
| UM 00105<br>UM 001D5<br>UM 002A5<br>UM 00375 | External output 1 signal output hold setting | H0 | Set whether or not to hold the output signal in the program mode when an error occurs.<br>H0: Not hold<br>H1: Hold | — |
| UM 00106<br>UM 001D6<br>UM 002A6<br>UM 00376 | External output 1 signal ON timing delay | U0 | Set the ON timing delay of external output 1 signal.<br>Setting range: 0 to 1,000 (The values out of the setting range are invalid.) | ms |
| UM 00107<br>UM 001D7<br>UM 002A7<br>UM 00377 | External output 1 signal ON hold time | U0 | Set the ON hold time of external output 1 signal.<br>Setting range: 0 to 1,000(The values out of the setting range are invalid.) | ms |

(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

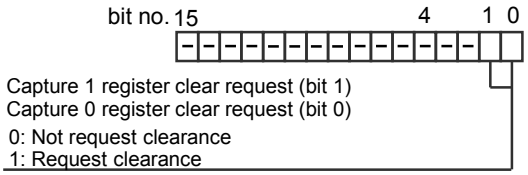
■ **Capture function**

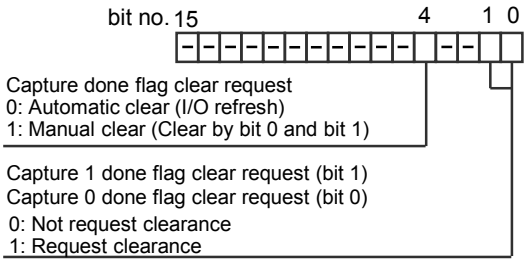
| Unit memory No.（Hex） | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00110<br>UM 001E0<br>UM 002B0<br>UM 00380 | Capture 0 setting | H0 | Make the setting for the capture function or sampling capture function.<br>H0: Not use capture 0 function<br>H1: Capture function at rising edge of control 0 signal<br>H2: Capture function at trailing edge of control 0 signal<br>H3: Capture function at rising edge of control 1 signal<br>H4: Capture function at trailing edge of control 1 signal<br>H5: Control 0 signal positive logic sampling capture function<br>H6: Control 0 signal negative logic sampling capture function<br>H7: Control 1 signal positive logic sampling capture function<br>H8: Control 1 signal negative logic sampling capture function<br>H9: Output relay (Y relay) sampling capture function<br>The capture 1 setting area is invalid when the sampling capture function (H5 to H9) is selected in the capture 0 setting. | — |
| UM 00111<br>UM 001E1<br>UM 002B1<br>UM 00381 | Capture 1 setting | H0 | Make the setting for the capture function or sampling capture function.<br>H0: Not use capture 1 function<br>H1: Capture function at rising edge of control 0 signal<br>H2: Capture function at trailing edge of control 0 signal<br>H3: Capture function at rising edge of control 1 signal<br>H4: Capture function at trailing edge of control 1 signal<br>However, this setting area is invalid when the sampling capture function (H5 to H9) is selected in the capture 0 setting. | — |
| UM 00112<br>UM 001E2<br>UM 002B2<br>UM 00382 | Capture function operation setting | H1 | Make the setting for the capture function or sampling capture function.<br>H0: One operation<br>H1: Continuous operation | — |
| UM 00113<br>UM 001E3<br>UM 002B3<br>UM 00383 | Sampling time | U1 | Set a sampling time.<br>Setting range: 1 to 65,535 (The values out of the setting range are invalid.) | ms |

(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

☛ next page

## ■ Capture function / Interrupt function

<table>
<tr><th>Unit memory No.（Hex）</th><th>Name</th><th>Default</th><th>Setting range and description</th><th>Unit</th></tr>
<tr><td>UM 00114<br>UM 001E4<br>UM 002B4<br>UM 00384</td><td>Capture value clear request</td><td>H0</td><td>
● Clears values stored in the capture registers and capture register buffers.<br>
● To clear the capture 0 register, turn off, on and off the bit 0 of the unit memory. To clear the capture 1 register, turn off, on and off the bit 1 of the unit memory.<br>
● Clears the areas of capture 0 register, capture 0 register buffer and register difference value buffer when requesting the capture 0 by executing the clearance of the capture 0 register.<br>
● Clears the areas of capture 1 register, capture 1 register buffer and register difference value buffer when requesting the capture 1 by executing the clearance of the capture 1 register.<br>


</td><td>—</td></tr>
<tr><td>UM 00115<br>UM 001E5<br>UM 002B5<br>UM 00385</td><td>Capture done flag clear request (Edge type)</td><td>H0</td><td>
It is used to reset the capture 0 done flag and capture 1 done flag using user programs. To reset the capture 0 done flag, write H11 and then H10. To reset the capture 0 done flag, write H12 and then H10.At the default setting, the request to clear the capture done flag is automatically made at the time of I/O refresh.<br>

bit no. 15
4
1 0
Capture done flag clear request
0: Automatic clear (I/O refresh)
1: Manual clear (Clear by bit 0 and bit 1)
Capture 1 done flag clear request (bit 1)
Capture 0 done flag clear request (bit 0)
0: Not request clearance
1: Request clearance
</td><td>—</td></tr>
<tr><td>UM 00118<br>UM 001E8<br>UM 002B8<br>UM 00388</td><td>Interrupt function enable/disable setting</td><td>H3</td><td>
Make the settings for the interrupt operation at the time of comparison match.
<table>
<tr><th>bit</th><th>Default</th><th>Description</th><th>Setting</th></tr>
<tr><td>0</td><td>1</td><td>Comparison match 0 flag</td><td rowspan="2">0: Disable<br>1: Enable</td></tr>
<tr><td>1</td><td>1</td><td>Comparison match 1 flag</td></tr>
<tr><td>15-2</td><td>-</td><td>-</td><td>-</td></tr>
</table>
</td><td>—</td></tr>
</table>

(Note 1) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

(Note 2) The capture value clear request and capture done flag clear request signals are available from the high-speed counter unit Ver.1.2. They can be set in user programs.

(Note 3) Even if the capture value clear request is executed, the number of completed capture operations in the buffer area will not be cleared. The number of completed capture operations will be cleared when the capture enable request (Y7) or the sampling capture function is activated.

Phone: 800.894.0412 - Fax: 888.723.4773 - Web: www.ctiautomation.net - Email: info@ctiautomation.net

### 11.4.3 Monitor Display Area

| Unit memory No. (Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 003A0 - UM 003A1<br>UM 003B0 - UM 003B1<br>UM 003C0 - UM 003C1<br>UM 003D0 - UM 003D1 | Count value | K0 | Current count value of counter<br>Range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| UM 003A2 - UM 003A3<br>UM 003B2 - UM 003B3<br>UM 003C2 - UM 003C3<br>UM 003D2 - UM 003D3 | Capture 0 register | K0 | Value of capture 0 register.<br>Range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| UM 003A4 - UM 003A5<br>UM 003B4 - UM 003B5<br>UM 003C4 - UM 003C5<br>UM 003D4 - UM 003D5 | Capture 1 register | K0 | Value of capture 1 register.<br>Range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| UM 003A6 - UM 003A7<br>UM 003B6 - UM 003B7<br>UM 003C6 - UM 003C7<br>UM 003D6 - UM 003D7 | Capture register difference value | K0 | Calculated difference between the capature registers<br>(Capture 1 register - Capture 0 register)<br>Range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| UM 003A8 - UM 003A9<br>UM 003B8 - UM 003B9<br>UM 003C8 - UM 003C9<br>UM 003D8 - UM 003D9 | Frequency measurement (Averaging) | U0 | Frequency measurement value after averaging procedure.<br>Range: 0 to 20,000,000<br>Signed 32-bit | Hz |
| UM 003AA -UM 003AB<br>UM 003BA -UM 003BB<br>UM 003CA - UM 003CB<br>UM 003DA - UM 003DB | Rotation speed measurement (Averaging) | U0 | Rotation speed measurement value after averaging procedure<br>Range: -1,200,000,000 to +1,200,000,000<br>Signed 32-bit | rpm |

(Note) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

## 11.4.4 Capture Value Buffer Area

■ **Capture value buffer area (For capture 0)**

| Unit memory No. (Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00400<br>UM 00600<br>UM 00800<br>UM 00A00 | Number of completed capture 0 operations | U0 | Monitors the number of completed capture 0 operations while capturing is enabled.<br>It is cleared to zero when the capture enable request (Y7, Y17, Y27 or Y37) is activated. | Times |
| UM 00402 - UM 00403<br>UM 00602 - UM 00603<br>UM 00802 - UM 00803<br>UM 00A02 - UM 00A03 | Capture 0 register buffer 1 | K0 | Once the capture processing is performed, the data stored in the capture 0 registers (UM 003x2 – UM 003x3) are transferred to the buffer 1.<br>The data are shifted and stored from the buffer 1 to buffer 60 sequentially.<br>Range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| (Omitted) | (Omitted) | | | |
| UM 00478 - UM 00479<br>UM 00678 - UM 00679<br>UM 00878 - UM 00879<br>UM 00A78 - UM 00A79 | Capture 0 register Buffer 60 | | | |
| UM 00482 - UM 00483<br>UM 00682 - UM 00683<br>UM 00882 - UM 00883<br>UM 00A82 - UM 00A83 | Capture register difference value for capture 0 request Buffer 1 | K0 | Transfers the difference between the capture 1 register (UM 003x4 - UM 003x5) and the capture 0 register (UM 003x2 - UM 003x3) to the buffer 1 when the capture request is made for the capture 0.<br>The data are shifted and stored from the buffer 1 to buffer 60 sequentially.<br>Range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| (Omitted) | (Omitted) | | | |
| UM 004F8 - UM 004F9<br>UM 006F8 - UM 006F9<br>UM 008F8 - UM 008F9<br>UM 00AF8 - UM 00AF9 | Capture register difference value for capture 0 request Buffer 60 | | | |

(Note 1) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.
(Note 2) The capture value buffer areas are available from the high-speed counter unit Ver.1.2.

◆ **REFERENCE**

- **For information on unit memory (UM) numbers corresponding to each buffer number, refer to the list beginning on page 11-23.**

■ **Capture value buffer area (For capture 1)**

| Unit memory No. (Hex) | Name | Default | Setting range and description | Unit |
|---|---|---|---|---|
| UM 00500<br>UM 00700<br>UM 00900<br>UM 00B00 | Number of completed capture 1 operations | U0 | Monitors the number of completed capture 1 operations while capturing is enabled.<br>It is cleared to zero when the capture enable request (Y7, Y17, Y27 or Y37) is activated. | Times |
| UM 00502 - UM 00503<br>UM 00702 - UM 00703<br>UM 00902 - UM 00903<br>UM 00B02 - UM 00B03 | Capture 1 Register Buffer 1 | K0 | Once the capture processing is performed, the data stored in the capture 1 registers (UM 003x4 - UM 003x5) are transferred to the buffer 1.<br>The data are shifted and stored from the buffer 1 to buffer 60 sequentially.<br>Range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| (Omitted) | (Omitted) | | | |
| UM 00578 - UM 00579<br>UM 00778 - UM 00779<br>UM 00978 - UM 00979<br>UM 00B78 - UM 00B79 | Capture 1 register Buffer 60 | | | |
| UM 00582 - UM 00583<br>UM 00782 - UM 00783<br>UM 00982 - UM 00983<br>UM 00B82 - UM 00B83 | Capture register difference value for capture 1 request Buffer 1 | K0 | Transfers the difference between the capture 1 register (UM 003x4 - UM 003x5) and the capture 0 register (UM 003x2 - UM 003x3) to the buffer 1 when the capture request is made for the capture 1. The data are shifted and stored from the buffer 1 to buffer 60 sequentially.<br>Range: -2,147,483,648 (8000 0000H) to 2,147,483,647 (7FFF FFFFH)<br>Signed 32-bit | Pulse |
| (Omitted) | (Omitted) | | | |
| UM 005F8 - UM 005F9<br>UM 007F8 - UM 007F9<br>UM 009F8 - UM 009F9<br>UM 00BF8 - UM 00BF9 | Capture register difference value for capture 1 request Buffer 60 | | | |

(Note 1) The unit memory numbers in the above table are for CH0, CH1, CH2 and CH3 from the top.

(Note 2) The capture value buffer areas are available from the high-speed counter unit Ver.1.2.

◆ **REFERENCE**

- **For information on unit memory (UM) numbers corresponding to each buffer number, refer to the list beginning on page 11-27.**

■ **Check list of unit memories (Capture 0 register buffers)**

| Buffer No. | Unit memory (UM) No. | | | |
|---|---|---|---|---|
| | CH0 | CH1 | CH2 | CH3 |
| Buffer 1 | UM00402-UM00403 | UM00602-UM00603 | UM00802-UM00803 | UM00A02-UM00A03 |
| Buffer 2 | UM00404-UM00405 | UM00604-UM00605 | UM00804-UM00805 | UM00A04-UM00A05 |
| Buffer 3 | UM00406-UM00407 | UM00606-UM00607 | UM00806-UM00807 | UM00A06-UM00A07 |
| Buffer 4 | UM00408-UM00409 | UM00608-UM00609 | UM00808-UM00809 | UM00A08-UM00A09 |
| Buffer 5 | UM0040A-UM0040B | UM0060A-UM0060B | UM0080A-UM0080B | UM00A0A-UM00A0B |
| Buffer 6 | UM0040C-UM0040D | UM0060C-UM0060D | UM0080C-UM0080D | UM00A0C-UM00A0D |
| Buffer 7 | UM0040E-UM0040F | UM0060E-UM0060F | UM0080E-UM0080F | UM00A0E-UM00A0F |
| Buffer 8 | UM00410-UM00411 | UM00610-UM00611 | UM00810-UM00811 | UM00A10-UM00A11 |
| Buffer 9 | UM00412-UM00413 | UM00612-UM00613 | UM00812-UM00813 | UM00A12-UM00A13 |
| Buffer 10 | UM00414-UM00415 | UM00614-UM00615 | UM00814-UM00815 | UM00A14-UM00A15 |
| Buffer 11 | UM00416-UM00417 | UM00616-UM00617 | UM00816-UM00817 | UM00A16-UM00A17 |
| Buffer 12 | UM00418-UM00419 | UM00618-UM00619 | UM00818-UM00819 | UM00A18-UM00A19 |
| Buffer 13 | UM0041A-UM0041B | UM0061A-UM0061B | UM0081A-UM0081B | UM00A1A-UM00A1B |
| Buffer 14 | UM0041C-UM0041D | UM0061C-UM0061D | UM0081C-UM0081D | UM00A1C-UM00A1D |
| Buffer 15 | UM0041E-UM0041F | UM0061E-UM0061F | UM0081E-UM0081F | UM00A1E-UM00A1F |
| Buffer 16 | UM00420-UM00421 | UM00620-UM00621 | UM00820-UM00821 | UM00A20-UM00A21 |
| Buffer 17 | UM00422-UM00423 | UM00622-UM00623 | UM00822-UM00823 | UM00A22-UM00A23 |
| Buffer 18 | UM00424-UM00425 | UM00624-UM00625 | UM00824-UM00825 | UM00A24-UM00A25 |
| Buffer 19 | UM00426-UM00427 | UM00626-UM00627 | UM00826-UM00827 | UM00A26-UM00A27 |
| Buffer 20 | UM00428-UM00429 | UM00628-UM00629 | UM00828-UM00829 | UM00A28-UM00A29 |
| Buffer 21 | UM0042A-UM0042B | UM0062A-UM0062B | UM0082A-UM0082B | UM00A2A-UM00A2B |
| Buffer 22 | UM0042C-UM0042D | UM0062C-UM0062D | UM0082C-UM0082D | UM00A2C-UM00A2D |
| Buffer 23 | UM0042E-UM0042F | UM0062E-UM0062F | UM0082E-UM0082F | UM00A2E-UM00A2F |
| Buffer 24 | UM00430-UM00431 | UM00630-UM00631 | UM00830-UM00831 | UM00A30-UM00A31 |
| Buffer 25 | UM00432-UM00433 | UM00632-UM00633 | UM00832-UM00833 | UM00A32-UM00A33 |
| Buffer 26 | UM00434-UM00435 | UM00634-UM00635 | UM00834-UM00835 | UM00A34-UM00A35 |
| Buffer 27 | UM00436-UM00437 | UM00636-UM00637 | UM00836-UM00837 | UM00A36-UM00A37 |
| Buffer 28 | UM00438-UM00439 | UM00638-UM00639 | UM00838-UM00839 | UM00A38-UM00A39 |
| Buffer 29 | UM0043A-UM0043B | UM0063A-UM0063B | UM0083A-UM0083B | UM00A3A-UM00A3B |
| Buffer 30 | UM0043C-UM0043D | UM0063C-UM0063D | UM0083C-UM0083D | UM00A3C-UM00A3D |

(Note 1) The capture value buffer areas are available from the high-speed counter unit Ver.1.2.

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■ **Check list of unit memories (Capture 0 register buffers)**

| Buffer No. | Unit memory (UM) No. | | | |
|---|---|---|---|---|
| | CH0 | CH1 | CH2 | CH3 |
| Buffer 31 | UM0043E-UM0043F | UM0063E-UM0063F | UM0083E-UM0083F | UM00A3E-UM00A3F |
| Buffer 32 | UM00440-UM00441 | UM00640-UM00641 | UM00840-UM00841 | UM00A40-UM00A41 |
| Buffer 33 | UM00442-UM00443 | UM00642-UM00643 | UM00842-UM00843 | UM00A42-UM00A43 |
| Buffer 34 | UM00444-UM00445 | UM00644-UM00645 | UM00844-UM00845 | UM00A44-UM00A45 |
| Buffer 35 | UM00446-UM00447 | UM00646-UM00647 | UM00846-UM00847 | UM00A46-UM00A47 |
| Buffer 36 | UM00448-UM00449 | UM00648-UM00649 | UM00848-UM00849 | UM00A48-UM00A49 |
| Buffer 37 | UM0044A-UM0044B | UM0064A-UM0064B | UM0084A-UM0084B | UM00A4A-UM00A4B |
| Buffer 38 | UM0044C-UM0044D | UM0064C-UM0064D | UM0084C-UM0084D | UM00A4C-UM00A4D |
| Buffer 39 | UM0044E-UM0044F | UM0064E-UM0064F | UM0084E-UM0084F | UM00A4E-UM00A4F |
| Buffer 40 | UM00450-UM00451 | UM00650-UM00651 | UM00850-UM00851 | UM00A50-UM00A51 |
| Buffer 41 | UM00452-UM00453 | UM00652-UM00653 | UM00852-UM00853 | UM00A52-UM00A53 |
| Buffer 42 | UM00454-UM00455 | UM00654-UM00655 | UM00854-UM00855 | UM00A54-UM00A55 |
| Buffer 43 | UM00456-UM00457 | UM00656-UM00657 | UM00856-UM00857 | UM00A56-UM00A57 |
| Buffer 44 | UM00458-UM00459 | UM00658-UM00659 | UM00858-UM00859 | UM00A58-UM00A59 |
| Buffer 45 | UM0045A-UM0045B | UM0065A-UM0065B | UM0085A-UM0085B | UM00A5A-UM00A5B |
| Buffer 46 | UM0045C-UM0045D | UM0065C-UM0065D | UM0085C-UM0085D | UM00A5C-UM00A5D |
| Buffer 47 | UM0045E-UM0045F | UM0065E-UM0065F | UM0085E-UM0085F | UM00A5E-UM00A5F |
| Buffer 48 | UM00460-UM00461 | UM00660-UM00661 | UM00860-UM00861 | UM00A60-UM00A61 |
| Buffer 49 | UM00462-UM00463 | UM00662-UM00663 | UM00862-UM00863 | UM00A62-UM00A63 |
| Buffer 50 | UM00464-UM00465 | UM00664-UM00665 | UM00864-UM00865 | UM00A64-UM00A65 |
| Buffer 51 | UM00466-UM00467 | UM00666-UM00667 | UM00866-UM00867 | UM00A66-UM00A67 |
| Buffer 52 | UM00468-UM00469 | UM00668-UM00669 | UM00868-UM00869 | UM00A68-UM00A69 |
| Buffer 53 | UM0046A-UM0046B | UM0066A-UM0066B | UM0086A-UM0086B | UM00A6A-UM00A6B |
| Buffer 54 | UM0046C-UM0046D | UM0066C-UM0066D | UM0086C-UM0086D | UM00A6C-UM00A6D |
| Buffer 55 | UM0046E-UM0046F | UM0066E-UM0066F | UM0086E-UM0086F | UM00A6E-UM00A6F |
| Buffer 56 | UM00470-UM00471 | UM00670-UM00671 | UM00870-UM00871 | UM00A70-UM00A71 |
| Buffer 57 | UM00472-UM00473 | UM00672-UM00673 | UM00872-UM00873 | UM00A72-UM00A73 |
| Buffer 58 | UM00474-UM00475 | UM00674-UM00675 | UM00874-UM00875 | UM00A74-UM00A75 |
| Buffer 59 | UM00476-UM00477 | UM00676-UM00677 | UM00876-UM00877 | UM00A76-UM00A77 |
| Buffer 60 | UM00478-UM00479 | UM00678-UM00679 | UM00878-UM00879 | UM00A78-UM00A79 |

(Note 1) The capture value buffer areas are available from the high-speed counter unit Ver.1.2.

■ **Check list of unit memories (Difference value buffer: Stored when Capture 0 request occurs.)**

| Buffer No. | Unit memory (UM) No. | | | |
|---|---|---|---|---|
| | CH0 | CH1 | CH2 | CH3 |
| Buffer 1 | UM00482-UM00483 | UM00682-UM00683 | UM00882-UM00883 | UM00A82-UM00A83 |
| Buffer 2 | UM00484-UM00485 | UM00684-UM00685 | UM00884-UM00885 | UM00A84-UM00A85 |
| Buffer 3 | UM00486-UM00487 | UM00686-UM00687 | UM00886-UM00887 | UM00A86-UM00A87 |
| Buffer 4 | UM00488-UM00489 | UM00688-UM00689 | UM00888-UM00889 | UM00A88-UM00A89 |
| Buffer 5 | UM0048A-UM0048B | UM0068A-UM0068B | UM0088A-UM0088B | UM00A8A-UM00A8B |
| Buffer 6 | UM0048C-UM0048D | UM0068C-UM0068D | UM0088C-UM0088D | UM00A8C-UM00A8D |
| Buffer 7 | UM0048E-UM0048F | UM0068E-UM0068F | UM0088E-UM0088F | UM00A8E-UM00A8F |
| Buffer 8 | UM00490-UM00491 | UM00690-UM00691 | UM00890-UM00891 | UM00A90-UM00A91 |
| Buffer 9 | UM00492-UM00493 | UM00692-UM00693 | UM00892-UM00893 | UM00A92-UM00A93 |
| Buffer 10 | UM00494-UM00495 | UM00694-UM00695 | UM00894-UM00895 | UM00A94-UM00A95 |
| Buffer 11 | UM00496-UM00497 | UM00696-UM00697 | UM00896-UM00897 | UM00A96-UM00A97 |
| Buffer 12 | UM00498-UM00499 | UM00698-UM00699 | UM00898-UM00899 | UM00A98-UM00A99 |
| Buffer 13 | UM0049A-UM0049B | UM0069A-UM0069B | UM0089A-UM0089B | UM00A9A-UM00A9B |
| Buffer 14 | UM0049C-UM0049D | UM0069C-UM0069D | UM0089C-UM0089D | UM00A9C-UM00A9D |
| Buffer 15 | UM0049E-UM0049F | UM0069E-UM0069F | UM0089E-UM0089F | UM00A9E-UM00A9F |
| Buffer 16 | UM004A0-UM004A1 | UM006A0-UM006A1 | UM008A0-UM008A1 | UM00AA0-UM00AA1 |
| Buffer 17 | UM004A2-UM004A3 | UM006A2-UM006A3 | UM008A2-UM008A3 | UM00AA2-UM00AA3 |
| Buffer 18 | UM004A4-UM004A5 | UM006A4-UM006A5 | UM008A4-UM008A5 | UM00AA4-UM00AA5 |
| Buffer 19 | UM004A6-UM004A7 | UM006A6-UM006A7 | UM008A6-UM008A7 | UM00AA6-UM00AA7 |
| Buffer 20 | UM004A8-UM004A9 | UM006A8-UM006A9 | UM008A8-UM008A9 | UM00AA8-UM00AA9 |
| Buffer 21 | UM004AA-UM004AB | UM006AA-UM006AB | UM008AA-UM008AB | UM00AAA-UM00AAB |
| Buffer 22 | UM004AC-UM004AD | UM006AC-UM006AD | UM008AC-UM008AD | UM00AAC-UM00AAD |
| Buffer 23 | UM004AE-UM004AF | UM006AE-UM006AF | UM008AE-UM008AF | UM00AAE-UM00AAF |
| Buffer 24 | UM004B0-UM004B1 | UM006B0-UM006B1 | UM008B0-UM008B1 | UM00AB0-UM00AB1 |
| Buffer 25 | UM004B2-UM004B3 | UM006B2-UM006B3 | UM008B2-UM008B3 | UM00AB2-UM00AB3 |
| Buffer 26 | UM004B4-UM004B5 | UM006B4-UM006B5 | UM008B4-UM008B5 | UM00AB4-UM00AB5 |
| Buffer 27 | UM004B6-UM004B7 | UM006B6-UM006B7 | UM008B6-UM008B7 | UM00AB6-UM00AB7 |
| Buffer 28 | UM004B8-UM004B9 | UM006B8-UM006B9 | UM008B8-UM008B9 | UM00AB8-UM00AB9 |
| Buffer 29 | UM004BA-UM004BB | UM006BA-UM006BB | UM008BA-UM008BB | UM00ABA-UM00ABB |
| Buffer 30 | UM004BC-UM004BD | UM006BC-UM006BD | UM008BC-UM008BD | UM00ABC-UM00ABD |

(Note 1) The capture value buffer areas are available from the high-speed counter unit Ver.1.2.

(Note 2) In the above areas, the capture register difference values (Capture 1 register 1 - Capture 0 register) are stored when capturing for the capture 0 register is executed.

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■ **Check list of unit memories (Difference value buffer: Stored when Capture 0 request occurs.)**

| Buffer No. | Unit memory (UM) No. | | | |
|---|---|---|---|---|
| | CH0 | CH1 | CH2 | CH3 |
| Buffer 31 | UM004BE-UM004BF | UM006BE-UM006BF | UM008BE-UM008BF | UM00ABE-UM00ABF |
| Buffer 32 | UM004C0-UM004C1 | UM006C0-UM006C1 | UM008C0-UM008C1 | UM00AC0-UM00AC1 |
| Buffer 33 | UM004C2-UM004C3 | UM006C2-UM006C3 | UM008C2-UM008C3 | UM00AC2-UM00AC3 |
| Buffer 34 | UM004C4-UM004C5 | UM006C4-UM006C5 | UM008C4-UM008C5 | UM00AC4-UM00AC5 |
| Buffer 35 | UM004C6-UM004C7 | UM006C6-UM006C7 | UM008C6-UM008C7 | UM00AC6-UM00AC7 |
| Buffer 36 | UM004C8-UM004C9 | UM006C8-UM006C9 | UM008C8-UM008C9 | UM00AC8-UM00AC9 |
| Buffer 37 | UM004CA-UM004CB | UM006CA-UM006CB | UM008CA-UM008CB | UM00ACA-UM00ACB |
| Buffer 38 | UM004CC-UM004CD | UM006CC-UM006CD | UM008CC-UM008CD | UM00ACC-UM00ACD |
| Buffer 39 | UM004CE-UM004CF | UM006CE-UM006CF | UM008CE-UM008CF | UM00ACE-UM00ACF |
| Buffer 40 | UM004D0-UM004D1 | UM006D0-UM006D1 | UM008D0-UM008D1 | UM00AD0-UM00AD1 |
| Buffer 41 | UM004D2-UM004D3 | UM006D2-UM006D3 | UM008D2-UM008D3 | UM00AD2-UM00AD3 |
| Buffer 42 | UM004D4-UM004D5 | UM006D4-UM006D5 | UM008D4-UM008D5 | UM00AD4-UM00AD5 |
| Buffer 43 | UM004D6-UM004D7 | UM006D6-UM006D7 | UM008D6-UM008D7 | UM00AD6-UM00AD7 |
| Buffer 44 | UM004D8-UM004D9 | UM006D8-UM006D9 | UM008D8-UM008D9 | UM00AD8-UM00AD9 |
| Buffer 45 | UM004DA-UM004DB | UM006DA-UM006DB | UM008DA-UM008DB | UM00ADA-UM00ADB |
| Buffer 46 | UM004DC-UM004DD | UM006DC-UM006DD | UM008DC-UM008DD | UM00ADC-UM00ADD |
| Buffer 47 | UM004DE-UM004DF | UM006DE-UM006DF | UM008DE-UM008DF | UM00ADE-UM00ADF |
| Buffer 48 | UM004E0-UM004E1 | UM006E0-UM006E1 | UM008E0-UM008E1 | UM00AE0-UM00AE1 |
| Buffer 49 | UM004E2-UM004E3 | UM006E2-UM006E3 | UM008E2-UM008E3 | UM00AE2-UM00AE3 |
| Buffer 50 | UM004E4-UM004E5 | UM006E4-UM006E5 | UM008E4-UM008E5 | UM00AE4-UM00AE5 |
| Buffer 51 | UM004E6-UM004E7 | UM006E6-UM006E7 | UM008E6-UM008E7 | UM00AE6-UM00AE7 |
| Buffer 52 | UM004E8-UM004E9 | UM006E8-UM006E9 | UM008E8-UM008E9 | UM00AE8-UM00AE9 |
| Buffer 53 | UM004EA-UM004EB | UM006EA-UM006EB | UM008EA-UM008EB | UM00AEA-UM00AEB |
| Buffer 54 | UM004EC-UM004ED | UM006EC-UM006ED | UM008EC-UM008ED | UM00AEC-UM00AED |
| Buffer 55 | UM004EE-UM004EF | UM006EE-UM006EF | UM008EE-UM008EF | UM00AEE-UM00AEF |
| Buffer 56 | UM004F0-UM004F1 | UM006F0-UM006F1 | UM008F0-UM008F1 | UM00AF0-UM00AF1 |
| Buffer 57 | UM004F2-UM004F3 | UM006F2-UM006F3 | UM008F2-UM008F3 | UM00AF2-UM00AF3 |
| Buffer 58 | UM004F4-UM004F5 | UM006F4-UM006F5 | UM008F4-UM008F5 | UM00AF4-UM00AF5 |
| Buffer 59 | UM004F6-UM004F7 | UM006F6-UM006F7 | UM008F6-UM008F7 | UM00AF6-UM00AF7 |
| Buffer 60 | UM004F8-UM004F9 | UM006F8-UM006F9 | UM008F8-UM008F9 | UM00AF8-UM00AF9 |

(Note 1) The capture value buffer areas are available from the high-speed counter unit Ver.1.2.

(Note 2) In the above areas, the capture register difference values (Capture 1 register 1 - Capture 0 register) are stored when capturing for the capture 0 register is executed.

■ **Check list of unit memories (Capture 1 register buffers)**

| Buffer No. | Unit memory (UM) No. | | | |
|---|---|---|---|---|
| | CH0 | CH1 | CH2 | CH3 |
| Buffer 1 | UM00502-UM00503 | UM00702-UM00703 | UM00902-UM00903 | UM00B02-UM00B03 |
| Buffer 2 | UM00504-UM00505 | UM00704-UM00705 | UM00904-UM00905 | UM00B04-UM00B05 |
| Buffer 3 | UM00506-UM00507 | UM00706-UM00707 | UM00906-UM00907 | UM00B06-UM00B07 |
| Buffer 4 | UM00508-UM00509 | UM00708-UM00709 | UM00908-UM00909 | UM00B08-UM00B09 |
| Buffer 5 | UM0050A-UM0050B | UM0070A-UM0070B | UM0090A-UM0090B | UM00B0A-UM00B0B |
| Buffer 6 | UM0050C-UM0050D | UM0070C-UM0070D | UM0090C-UM0090D | UM00B0C-UM00B0D |
| Buffer 7 | UM0050E-UM0050F | UM0070E-UM0070F | UM0090E-UM0090F | UM00B0E-UM00B0F |
| Buffer 8 | UM00510-UM00511 | UM00710-UM00711 | UM00910-UM00911 | UM00B10-UM00B11 |
| Buffer 9 | UM00512-UM00513 | UM00712-UM00713 | UM00912-UM00913 | UM00B12-UM00B13 |
| Buffer 10 | UM00514-UM00515 | UM00714-UM00715 | UM00914-UM00915 | UM00B14-UM00B15 |
| Buffer 11 | UM00516-UM00517 | UM00716-UM00717 | UM00916-UM00917 | UM00B16-UM00B17 |
| Buffer 12 | UM00518-UM00519 | UM00718-UM00719 | UM00918-UM00919 | UM00B18-UM00B19 |
| Buffer 13 | UM0051A-UM0051B | UM0071A-UM0071B | UM0091A-UM0091B | UM00B1A-UM00B1B |
| Buffer 14 | UM0051C-UM0051D | UM0071C-UM0071D | UM0091C-UM0091D | UM00B1C-UM00B1D |
| Buffer 15 | UM0051E-UM0051F | UM0071E-UM0071F | UM0091E-UM0091F | UM00B1E-UM00B1F |
| Buffer 16 | UM00520-UM00521 | UM00720-UM00721 | UM00920-UM00921 | UM00B20-UM00B21 |
| Buffer 17 | UM00522-UM00523 | UM00722-UM00723 | UM00922-UM00923 | UM00B22-UM00B23 |
| Buffer 18 | UM00524-UM00525 | UM00724-UM00725 | UM00924-UM00925 | UM00B24-UM00B25 |
| Buffer 19 | UM00526-UM00527 | UM00726-UM00727 | UM00926-UM00927 | UM00B26-UM00B27 |
| Buffer 20 | UM00528-UM00529 | UM00728-UM00729 | UM00928-UM00929 | UM00B28-UM00B29 |
| Buffer 21 | UM0052A-UM0052B | UM0072A-UM0072B | UM0092A-UM0092B | UM00B2A-UM00B2B |
| Buffer 22 | UM0052C-UM0052D | UM0072C-UM0072D | UM0092C-UM0092D | UM00B2C-UM00B2D |
| Buffer 23 | UM0052E-UM0052F | UM0072E-UM0072F | UM0092E-UM0092F | UM00B2E-UM00B2F |
| Buffer 24 | UM00530-UM00531 | UM00730-UM00731 | UM00930-UM00931 | UM00B30-UM00B31 |
| Buffer 25 | UM00532-UM00533 | UM00732-UM00733 | UM00932-UM00933 | UM00B32-UM00B33 |
| Buffer 26 | UM00534-UM00535 | UM00734-UM00735 | UM00934-UM00935 | UM00B34-UM00B35 |
| Buffer 27 | UM00536-UM00537 | UM00736-UM00737 | UM00936-UM00937 | UM00B36-UM00B37 |
| Buffer 28 | UM00538-UM00539 | UM00738-UM00739 | UM00938-UM00939 | UM00B38-UM00B39 |
| Buffer 29 | UM0053A-UM0053B | UM0073A-UM0073B | UM0093A-UM0093B | UM00B3A-UM00B3B |
| Buffer 30 | UM0053C-UM0053D | UM0073C-UM0073D | UM0093C-UM0093D | UM00B3C-UM00B3D |

(Note 1) The capture value buffer areas are available from the high-speed counter unit Ver.1.2.

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■ **Check list of unit memories (Capture 1 register buffers)**

| Buffer No. | Unit memory (UM) No. | | | |
|---|---|---|---|---|
| | CH0 | CH1 | CH2 | CH3 |
| Buffer 31 | UM0053E-UM0053F | UM0073E-UM0073F | UM0093E-UM0093F | UM00B3E-UM00B3F |
| Buffer 32 | UM00540-UM00541 | UM00740-UM00741 | UM00940-UM00941 | UM00B40-UM00B41 |
| Buffer 33 | UM00542-UM00543 | UM00742-UM00743 | UM00942-UM00943 | UM00B42-UM00B43 |
| Buffer 34 | UM00544-UM00545 | UM00744-UM00745 | UM00944-UM00945 | UM00B44-UM00B45 |
| Buffer 35 | UM00546-UM00547 | UM00746-UM00747 | UM00946-UM00947 | UM00B46-UM00B47 |
| Buffer 36 | UM00548-UM00549 | UM00748-UM00749 | UM00948-UM00949 | UM00B48-UM00B49 |
| Buffer 37 | UM0054A-UM0054B | UM0074A-UM0074B | UM0094A-UM0094B | UM00B4A-UM00B4B |
| Buffer 38 | UM0054C-UM0054D | UM0074C-UM0074D | UM0094C-UM0094D | UM00B4C-UM00B4D |
| Buffer 39 | UM0054E-UM0054F | UM0074E-UM0074F | UM0094E-UM0094F | UM00B4E-UM00B4F |
| Buffer 40 | UM00550-UM00551 | UM00750-UM00751 | UM00950-UM00951 | UM00B50-UM00B51 |
| Buffer 41 | UM00552-UM00553 | UM00752-UM00753 | UM00952-UM00953 | UM00B52-UM00B53 |
| Buffer 42 | UM00554-UM00555 | UM00754-UM00755 | UM00954-UM00955 | UM00B54-UM00B55 |
| Buffer 43 | UM00556-UM00557 | UM00756-UM00757 | UM00956-UM00957 | UM00B56-UM00B57 |
| Buffer 44 | UM00558-UM00559 | UM00758-UM00759 | UM00958-UM00959 | UM00B58-UM00B59 |
| Buffer 45 | UM0055A-UM0055B | UM0075A-UM0075B | UM0095A-UM0095B | UM00B5A-UM00B5B |
| Buffer 46 | UM0055C-UM0055D | UM0075C-UM0075D | UM0095C-UM0095D | UM00B5C-UM00B5D |
| Buffer 47 | UM0055E-UM0055F | UM0075E-UM0075F | UM0095E-UM0095F | UM00B5E-UM00B5F |
| Buffer 48 | UM00560-UM00561 | UM00760-UM00761 | UM00960-UM00961 | UM00B60-UM00B61 |
| Buffer 49 | UM00562-UM00563 | UM00762-UM00763 | UM00962-UM00963 | UM00B62-UM00B63 |
| Buffer 50 | UM00564-UM00565 | UM00764-UM00765 | UM00964-UM00965 | UM00B64-UM00B65 |
| Buffer 51 | UM00566-UM00567 | UM00766-UM00767 | UM00966-UM00967 | UM00B66-UM00B67 |
| Buffer 52 | UM00568-UM00569 | UM00768-UM00769 | UM00968-UM00969 | UM00B68-UM00B69 |
| Buffer 53 | UM0056A-UM0056B | UM0076A-UM0076B | UM0096A-UM0096B | UM00B6A-UM00B6B |
| Buffer 54 | UM0056C-UM0056D | UM0076C-UM0076D | UM0096C-UM0096D | UM00B6C-UM00B6D |
| Buffer 55 | UM0056E-UM0056F | UM0076E-UM0076F | UM0096E-UM0096F | UM00B6E-UM00B6F |
| Buffer 56 | UM00570-UM00571 | UM00770-UM00771 | UM00970-UM00971 | UM00B70-UM00B71 |
| Buffer 57 | UM00572-UM00573 | UM00772-UM00773 | UM00972-UM00973 | UM00B72-UM00B73 |
| Buffer 58 | UM00574-UM00575 | UM00774-UM00775 | UM00974-UM00975 | UM00B74-UM00B75 |
| Buffer 59 | UM00576-UM00577 | UM00776-UM00777 | UM00976-UM00977 | UM00B76-UM00B77 |
| Buffer 60 | UM00578-UM00579 | UM00778-UM00779 | UM00978-UM00979 | UM00B78-UM00B79 |

(Note 1) The capture value buffer areas are available from the high-speed counter unit Ver.1.2.

■ **Check list of unit memories (Difference value buffer: Stored when Capture 1 request occurs.)**

| Buffer No. | Unit memory (UM) No. | | | |
|---|---|---|---|---|
| | CH0 | CH1 | CH2 | CH3 |
| Buffer 1 | UM00582-UM00583 | UM00782-UM00783 | UM00982-UM00983 | UM00B82-UM00B83 |
| Buffer 2 | UM00584-UM00585 | UM00784-UM00785 | UM00984-UM00985 | UM00B84-UM00B85 |
| Buffer 3 | UM00586-UM00587 | UM00786-UM00787 | UM00986-UM00987 | UM00B86-UM00B87 |
| Buffer 4 | UM00588-UM00589 | UM00788-UM00789 | UM00988-UM00989 | UM00B88-UM00B89 |
| Buffer 5 | UM0058A-UM0058B | UM0078A-UM0078B | UM0098A-UM0098B | UM00B8A-UM00B8B |
| Buffer 6 | UM0058C-UM0058D | UM0078C-UM0078D | UM0098C-UM0098D | UM00B8C-UM00B8D |
| Buffer 7 | UM0058E-UM0058F | UM0078E-UM0078F | UM0098E-UM0098F | UM00B8E-UM00B8F |
| Buffer 8 | UM00590-UM00591 | UM00790-UM00791 | UM00990-UM00991 | UM00B90-UM00B91 |
| Buffer 9 | UM00592-UM00593 | UM00792-UM00793 | UM00992-UM00993 | UM00B92-UM00B93 |
| Buffer 10 | UM00594-UM00595 | UM00794-UM00795 | UM00994-UM00995 | UM00B94-UM00B95 |
| Buffer 11 | UM00596-UM00597 | UM00796-UM00797 | UM00996-UM00997 | UM00B96-UM00B97 |
| Buffer 12 | UM00598-UM00599 | UM00798-UM00799 | UM00998-UM00999 | UM00B98-UM00B99 |
| Buffer 13 | UM0059A-UM0059B | UM0079A-UM0079B | UM0099A-UM0099B | UM00B9A-UM00B9B |
| Buffer 14 | UM0059C-UM0059D | UM0079C-UM0079D | UM0099C-UM0099D | UM00B9C-UM00B9D |
| Buffer 15 | UM0059E-UM0059F | UM0079E-UM0079F | UM0099E-UM0099F | UM00B9E-UM00B9F |
| Buffer 16 | UM005A0-UM005A1 | UM007A0-UM007A1 | UM009A0-UM009A1 | UM00BA0-UM00BA1 |
| Buffer 17 | UM005A2-UM005A3 | UM007A2-UM007A3 | UM009A2-UM009A3 | UM00BA2-UM00BA3 |
| Buffer 18 | UM005A4-UM005A5 | UM007A4-UM007A5 | UM009A4-UM009A5 | UM00BA4-UM00BA5 |
| Buffer 19 | UM005A6-UM005A7 | UM007A6-UM007A7 | UM009A6-UM009A7 | UM00BA6-UM00BA7 |
| Buffer 20 | UM005A8-UM005A9 | UM007A8-UM007A9 | UM009A8-UM009A9 | UM00BA8-UM00BA9 |
| Buffer 21 | UM005AA-UM005AB | UM007AA-UM007AB | UM009AA-UM009AB | UM00BAA-UM00BAB |
| Buffer 22 | UM005AC-UM005AD | UM007AC-UM007AD | UM009AC-UM009AD | UM00BAC-UM00BAD |
| Buffer 23 | UM005AE-UM005AF | UM007AE-UM007AF | UM009AE-UM009AF | UM00BAE-UM00BAF |
| Buffer 24 | UM005B0-UM005B1 | UM007B0-UM007B1 | UM009B0-UM009B1 | UM00BB0-UM00BB1 |
| Buffer 25 | UM005B2-UM005B3 | UM007B2-UM007B3 | UM009B2-UM009B3 | UM00BB2-UM00BB3 |
| Buffer 26 | UM005B4-UM005B5 | UM007B4-UM007B5 | UM009B4-UM009B5 | UM00BB4-UM00BB5 |
| Buffer 27 | UM005B6-UM005B7 | UM007B6-UM007B7 | UM009B6-UM009B7 | UM00BB6-UM00BB7 |
| Buffer 28 | UM005B8-UM005B9 | UM007B8-UM007B9 | UM009B8-UM009B9 | UM00BB8-UM00BB9 |
| Buffer 29 | UM005BA-UM005BB | UM007BA-UM007BB | UM009BA-UM009BB | UM00BBA-UM00BBB |
| Buffer 30 | UM005BC-UM005BD | UM007BC-UM007BD | UM009BC-UM009BD | UM00BBC-UM00BBD |

(Note 1) The capture value buffer areas are available from the high-speed counter unit Ver.1.2.

(Note 2) In the above areas, the capture register difference values (Capture 1 register 1 - Capture 0 register) are stored when capturing for the capture 1 register is executed.

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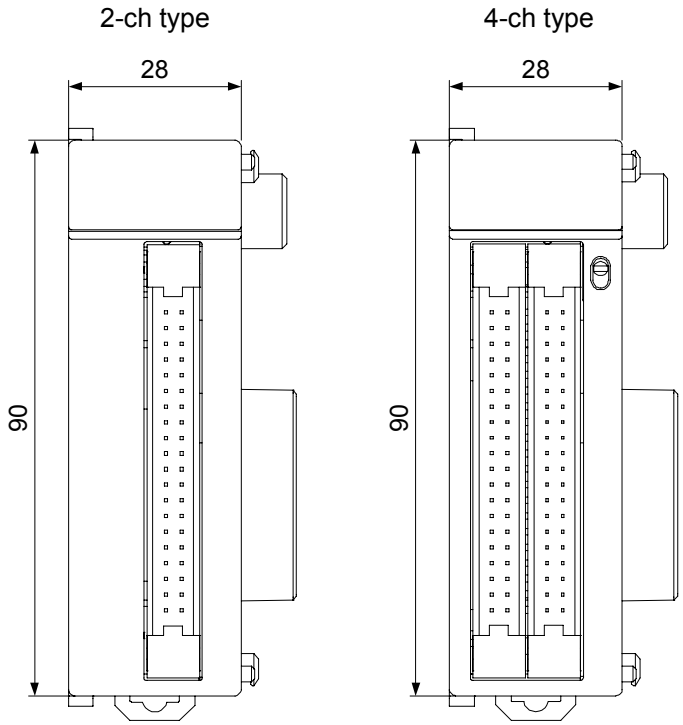
■ **Check list of unit memories (Difference value buffer: Stored when Capture 1 request occurs.)**

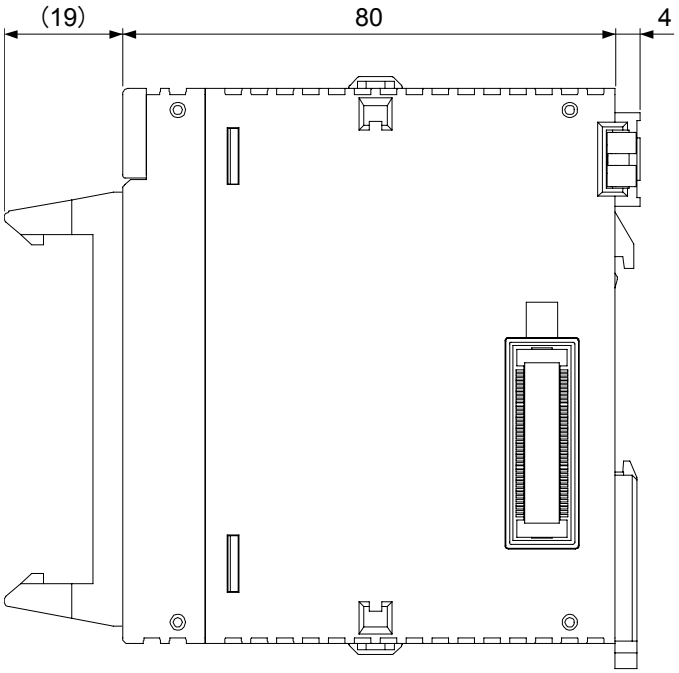
| Buffer No. | Unit memory (UM) No. | | | |
|---|---|---|---|---|
| | CH0 | CH1 | CH2 | CH3 |
| Buffer 31 | UM005BE-UM005BF | UM007BE-UM007BF | UM009BE-UM009BF | UM00BBE-UM00BBF |
| Buffer 32 | UM005C0-UM005C1 | UM007C0-UM007C1 | UM009C0-UM009C1 | UM00BC0-UM00BC1 |
| Buffer 33 | UM005C2-UM005C3 | UM007C2-UM007C3 | UM009C2-UM009C3 | UM00BC2-UM00BC3 |
| Buffer 34 | UM005C4-UM005C5 | UM007C4-UM007C5 | UM009C4-UM009C5 | UM00BC4-UM00BC5 |
| Buffer 35 | UM005C6-UM005C7 | UM007C6-UM007C7 | UM009C6-UM009C7 | UM00BC6-UM00BC7 |
| Buffer 36 | UM005C8-UM005C9 | UM007C8-UM007C9 | UM009C8-UM009C9 | UM00BC8-UM00BC9 |
| Buffer 37 | UM005CA-UM005CB | UM007CA-UM007CB | UM009CA-UM009CB | UM00BCA-UM00BCB |
| Buffer 38 | UM005CC-UM005CD | UM007CC-UM007CD | UM009CC-UM009CD | UM00BCC-UM00BCD |
| Buffer 39 | UM005CE-UM005CF | UM007CE-UM007CF | UM009CE-UM009CF | UM00BCE-UM00BCF |
| Buffer 40 | UM005D0-UM005D1 | UM007D0-UM007D1 | UM009D0-UM009D1 | UM00BD0-UM00BD1 |
| Buffer 41 | UM005D2-UM005D3 | UM007D2-UM007D3 | UM009D2-UM009D3 | UM00BD2-UM00BD3 |
| Buffer 42 | UM005D4-UM005D5 | UM007D4-UM007D5 | UM009D4-UM009D5 | UM00BD4-UM00BD5 |
| Buffer 43 | UM005D6-UM005D7 | UM007D6-UM007D7 | UM009D6-UM009D7 | UM00BD6-UM00BD7 |
| Buffer 44 | UM005D8-UM005D9 | UM007D8-UM007D9 | UM009D8-UM009D9 | UM00BD8-UM00BD9 |
| Buffer 45 | UM005DA-UM005DB | UM007DA-UM007DB | UM009DA-UM009DB | UM00BDA-UM00BDB |
| Buffer 46 | UM005DC-UM005DD | UM007DC-UM007DD | UM009DC-UM009DD | UM00BDC-UM00BDD |
| Buffer 47 | UM005DE-UM005DF | UM007DE-UM007DF | UM009DE-UM009DF | UM00BDE-UM00BDF |
| Buffer 48 | UM005E0-UM005E1 | UM007E0-UM007E1 | UM009E0-UM009E1 | UM00BE0-UM00BE1 |
| Buffer 49 | UM005E2-UM005E3 | UM007E2-UM007E3 | UM009E2-UM009E3 | UM00BE2-UM00BE3 |
| Buffer 50 | UM005E4-UM005E5 | UM007E4-UM007E5 | UM009E4-UM009E5 | UM00BE4-UM00BE5 |
| Buffer 51 | UM005E6-UM005E7 | UM007E6-UM007E7 | UM009E6-UM009E7 | UM00BE6-UM00BE7 |
| Buffer 52 | UM005E8-UM005E9 | UM007E8-UM007E9 | UM009E8-UM009E9 | UM00BE8-UM00BE9 |
| Buffer 53 | UM005EA-UM005EB | UM007EA-UM007EB | UM009EA-UM009EB | UM00BEA-UM00BEB |
| Buffer 54 | UM005EC-UM005ED | UM007EC-UM007ED | UM009EC-UM009ED | UM00BEC-UM00BED |
| Buffer 55 | UM005EE-UM005EF | UM007EE-UM007EF | UM009EE-UM009EF | UM00BEE-UM00BEF |
| Buffer 56 | UM005F0-UM005F1 | UM007F0-UM007F1 | UM009F0-UM009F1 | UM00BF0-UM00BF1 |
| Buffer 57 | UM005F2-UM005F3 | UM007F2-UM007F3 | UM009F2-UM009F3 | UM00BF2-UM00BF3 |
| Buffer 58 | UM005F4-UM005F5 | UM007F4-UM007F5 | UM009F4-UM009F5 | UM00BF4-UM00BF5 |
| Buffer 59 | UM005F6-UM005F7 | UM007F6-UM007F7 | UM009F6-UM009F7 | UM00BF6-UM00BF7 |
| Buffer 60 | UM005F8-UM005F9 | UM007F8-UM007F9 | UM009F8-UM009F9 | UM00BF8-UM00BF9 |

(Note 1) The capture value buffer areas are available from the high-speed counter unit Ver.1.2.

(Note 2) In the above areas, the capture register difference values (Capture 1 register 1 - Capture 0 register) are stored when capturing for the capture 0 register is executed.

## 11.5 Dimensions



# Record of changes

| Manual No. | Date | Record of Changes |
|---|---|---|
| WUME-FP7HSC-01 | Oct.2013 | First Edition |
| WUME-FP7HSC-02 | Jun.2014 | Second Edition<br><br>Specification change: Capture function (Chapter 4.1, Chapter 8, Chapter 11.2 to 11.4)<br><br>Correction of sample programs related to "Operation Ready Request" and "Configuration Using User Programs" (Chapter 4.3, 4.4) |

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